INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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No. 4

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IN THIS ISSUE

Dr. Homer J. Smith again favors our readers with one of his "Current Comments." Its title "Meeting Student Desires" will interest many teachers of industrial arts and vocational education. This issue also contains an article on "Vocational Education's New Deal" by Superintendent H. H. Kirk. Charles F. Bauder of Philadelphia has contributed an interesting account of what industrial arts today is offering to the youth of his city. Drafting teachers will be delighted with the "Analysis of Machine Drawing" which has been set up by the Research Committee on Drafting of the Michigan Industrial Education Society. Auto-mechanics teachers will find a very worth-while article on their subject by Drew W. Castle, and farm-shop teachers will be interested in "Farm-Shop Management" by Howard.

THIS MONTH'S COVER

The picture on our cover this month shows the machine shop of the Lane Technical High School, Chicago, Ill. The equipment consists of 24 motor-head lathes, 1 large lathe, 2 presses, 1 saw, 2 grinders, 1 thread-cutting machine, and 1 heat-treatment furnace. There are also steel lockers for the student's shop apparel.

IMPORTANT CONVENTIONS

Once more do we call attention to the following conventions. It is necessary that those interested in industrial arts and vocational education do everything in their power to make these conventions a success. All of the associations listed have done much for professional advancement, but their efforts may not be allowed to lag now. It takes the attendance of the membership to make conventions successful.

Indiana Industrial Education Association at Terre Haute, Ind., March 29–30.

Western Arts Association at Chicago, Ill., April 3–7.

Eastern Arts Association at Philadelphia, Pa., April 10–13.

Illinois Vocational Association Convention, Champaign, Ill., April 19–20.

Michigan Industrial Education Association, Dearborn, Mich., April 25–27.

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are taking shop work for one of two reasons. Either their future profession demands this training, or they intend to put the experiences of your classroom into practice in their industrial life. In either event, it is important that they get their early training on the kind of equipment that will give them a truly practical background. The machines, 21 in number, which comprise the Yates-American "School Line" were designed primarily for school and shop work, and are fundamentally the same as the larger Yates-American industrial machines used in thousands of plants all over the world! We would consider it a privilege to send you whatever additional information you may desire. Please feel free to write us.

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Educational Department
New Britain, Conn.

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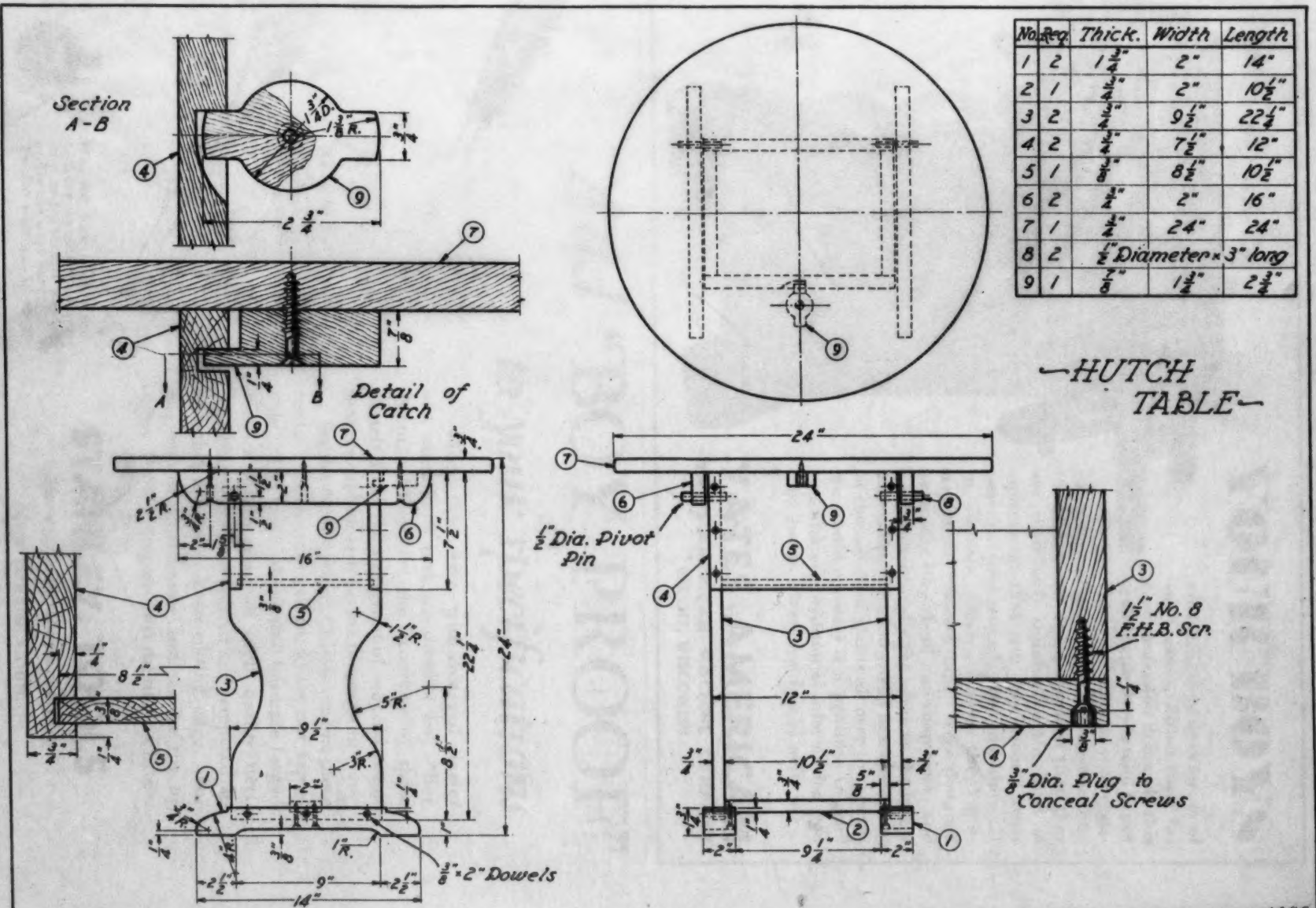
No.	Req.	Thick.	Width	Length
1	2	1¾"	2"	14"
2	1	¾"	2"	10½"
3	2	¾"	9½"	22¼"
4	2	¾"	7½"	12"
5	1	⅜"	8½"	10½"
6	2	¾"	2"	16"
7	1	¼"	24"	24"
8	2	½" Diameter ×	3" long	
9	1	⅞"	1¾"	2¾"



Designed by Donald A. Price, Chicago Heights, Illinois

(Described elsewhere in this issue)

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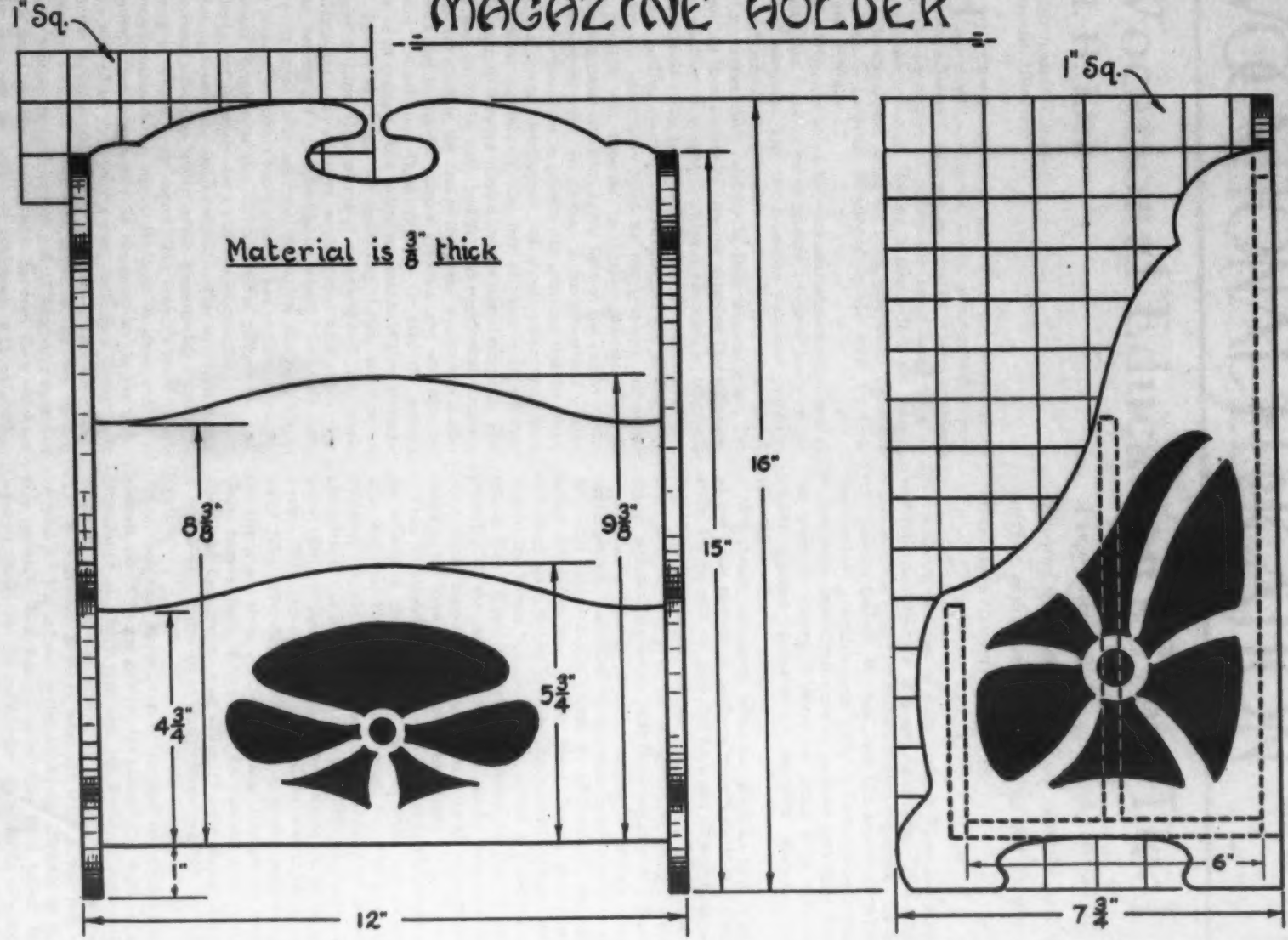

Designed by H. L. Weatherby, Montgomery, Alabama

(Described elsewhere in this issue)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

April, 1935
Vol. 24, No. 4

Vocational Education's New Deal

H. H. Kirk

Superintendent of Schools,
Faribault, Minnesota

A superintendent's views on why industrial arts and vocational education must be part of the educational offerings of our future secondary schools.

HISTORY in the future will record the present as an era of self-examination. Today, governmental theories are being questioned, industrial organization is being criticized, and the institutions of society are being called upon to justify their existence. Nothing is sacred. It is not surprising that educational values are being questioned. Vocational education in particular is selected by the critic for most caustic criticism.

The Minnesota set-up for vocational education has been of a kind that is conducive to produce a type of laxity on the part of educators. The state subsidizes vocational courses in our high schools. It plans such courses in very minute detail, and supervises them carefully in their administration. The effect has been a sense of security, a feeling that all's well, that whatever is, is right. Vocational education in Minnesota high schools today is characterized by a minimum of philosophy and an emphasis upon techniques and devices. Philosophy is unnecessary when all our problems are settled for us. It is well, however, to consider philosophy and to study vocational education in the light of our rapidly changing society, to justify its presence in our educational scheme, and to define as far as possible the problems that lie ahead.

If we proceed intelligently, we should make some basic distinctions immediately. The first of these is an arbitrary differentiation between cultural and vocational education. This will lead us, to be sure, into several paradoxical positions. Take, for example, the case of the young woman who studies French and history for cultural purposes, and who later becomes a teacher of those subjects. Or take the writer's case as an example. As a college student, he studied mechanical drawing as a basis for engineering. Later, he became a teacher of Latin. He was broader, more cultured, so to speak, by reason of his vicarious acquaintance with engineering. Since becoming a superintendent of schools, the writer made frequent use of his knowledge of mechanical drawing in checking plans of architects and engineers. Let us then define vocational education as that which prepares deliberately, consciously, and definitely, for a career or occupation.

Let us narrow the discussion still further by deciding that vocational education is that which prepares for occupations having a definite trade aspect. The lawyer's work is distinctly professional in aspect. He deals in ideas, and he is relatively free from routine. In the same day, he may draw up a will, advise in a divorce case, institute a damage suit, examine a title, and defend a criminal. The automobile-assembly workman works with materials, and his work is largely routine. He adjusts bolt No. 37 hour after hour. His work has a definite trade aspect. Between these extremes, there is an infinite number of gradations, with no absolute line of demarcation.

From the broad educational viewpoint, the present program of vocational education is easily justified. From the purely vocational point of view, it is open to question. "How many skilled mechanics has your manual-training department turned out?" cries a doubter. We might ask him how many skilled linguists have come from our Latin or French departments, or how many trained mathematical geniuses have come from our geometry classes. Whether we admit it or not, our present nebulous conception of vocational education with vocations is open to criticism.

Nevertheless, vocational education plays its part in the present effort to treat all pupils as individuals. If it is worth while, for example, to keep 960 boys and girls in Faribault High School, vocational education is justified. In the fifteen years from 1897 to 1912, the enrollment in Faribault High School remained stationary, with approximately 200 pupils in attendance. Then in 1912, the offering of the high school was expanded. Vocational courses were introduced. With no noticeable change in the population of Faribault, the high school doubled in size in three years. Several years later, it doubled again. Before 1912, several hundred boys and girls roamed the streets because the high school had nothing to attract them. When the high school began to plan its program for all the children of all the people, they came in. What would happen if the vocational courses were discontinued is too obvious to require elaboration.

Then, vocational education plays its part in the efforts of the schools to develop proper character traits and leisure-time interests. These go hand in hand; for it is generally conceded that the use of leisure time can build or destroy character. If this is true, then we can readily see the educational effects, in terms of character building, of the vocational courses. Who will deny the value of the workbench in the attic? Who will ridicule needlework, gardening projects, or the raising of calves, corn, or chickens? Through the vocational courses, boys and girls acquire interests that persist throughout life, interests that will carry them through many a period when Satan could easily devise mischief for idle hands.

The vocational courses can be justified on psychological grounds, also. Boys and girls become successful in doing things they like to do. Thirty years ago, Mr. Dooley, a comic-strip character, ridiculed the offering of the schools by stating that "it makes no difference what you teach a boy, just so he hates it." The sad part is that some people thought he said this seriously. Two western universities have tested Mr. Dooley's theory by the experiment of admitting freshmen on the basis of any sixteen units offered. Students thus admitted have been compared with students admitted on the

basis of traditional entrance credits. The gratifying result has been that no differences have been observed in the respective abilities of the two groups to master college work. Those admitted on the basis of vocational credits do just as well as the others; and the belief in the disciplinary value of the classics receives a severe blow. In other words, it makes little difference, from the standpoint of mental training what you teach a boy, just so he has an aptitude for it and succeeds in it.

The present vocational program can be justified also in terms of cost. Let us assume that we drop from the Faribault teaching staff two industrial teachers and two teachers in home economics. Immediately 500 boys and girls become idle during a portion of the day. Something must be done with them. Other classes are full. To put them in the study hall is to dodge the problem. Let us therefore organize new classes for them, and employ four other teachers to teach them. The cost is the same as before. In any high school that is efficiently administered, the difference in cost will be negligible, whether we have an enriched program, including vocational courses, or the traditional program of thirty years ago. Any program of education that will hold the present army of boys and girls in school will be just as expensive as that now in operation.

Thus far, we have considered only the matter of justifying vocational education as it is now organized. With certain admitted weaknesses, vocational education is still a very potent and worth-while feature of a broad program of education. Now let us take a rapid survey of what lies ahead.

As Stuart Chase has so aptly pointed out, the pioneer era is past. There is no longer government land or virgin soil to which we may escape. We can no longer overflow into an indefinite West. We must settle our problems at home. Technological progress, which has created problems here, has proceeded also in foreign countries. Like us, they are rapidly reaching the point where they can produce what they need at home. If we except such articles as coffee, spices, and dyes, we may truthfully say that the nations of the world are rapidly becoming self-subsistent. They will produce, eventually, within their own borders, most of the things which they will consume. It is unnecessary to point out the probable consequent effects upon international trade.

America will be no exception. It is said that our population will be stabilized in 1950. A stabilization in industry seems inevitable. We shall produce what we need in fewer hours per day, fewer days per week, and fewer weeks per year. Industry will become more highly specialized and mechanized. The separate operations in industry will be more simple and more easily learned. Because of our stabilized population and our technological progress, boys and girls will enter industry later in life, and adults will cease work at an earlier age. If we have sufficient intelligence and courage, our economic and industrial life will be so reorganized that a decent standard of living will go hand in hand with the reorganization. God grant that those in positions of leadership may have the intelligence to devise ways and means of enabling the common man to purchase the products of our coming industrial age. If this problem is not wisely settled, we shall soon be at work, digging ourselves out of another depression.

Technological progress will have several effects upon the worker. The first striking effect is that the worker's interest in what he is doing will be still further minimized. The packing-house workman, who removes tallow all day long, will hardly point with pride of ownership to the stored sections of meat. The factory workman who adjusts bolt No. 37 all day long will not experience much pride as he looks at the finished automobile. Through repetition, hour after hour, he will develop a skill of performance that will make continuous attention to his work unnecessary. His mind will be free to think. He will be, strange as it may seem, mentally at leisure while working.

Let us consider an illustration that will make this point clear. A mother, making clothes for her first baby, is engaged in a thrilling and absorbing occupation. The woman in the garment factory, tending a buttonhole machine, gets no such thrill. The mental freedom in the latter case is very likely to be out of harmony with the physical toil. This mental clash can easily result in discontent, poor work, drifting from job to job, and a lowered standard of living.

There is also the problem of the increased amounts of leisure time at the end of the day and at the end of the week. This was not a problem in the era of the twelve-hour day. It is a problem of serious magnitude today, and it will become more serious with every improvement in machinery. Will the American workman consider these additional hours a blessing or a curse?

As we look ahead, it is obvious that there are several very important problems for the educator to solve. The first is a problem for the philosopher. It is that of appraising our inevitable industrial future, and of deciding what type of industrial education will best fit it. The training of workers will be simple, compared to the task of deciding what training to give. It will be difficult to replace our present conception of general vocational education with "conceptions and terminology that deal with specific vocations — for example, carpentry, barbering, restaurant cooking, and auto-truck driving." Snedden clearly points out that any 100 boys entering any typical American high school, will, fifteen years later, be found distributed among seventy to eighty unlike vocations. The philosopher must eliminate this waste, first, by determining for us as accurately as possible what the trades of the future are going to be, and second, by sketching for us the many specific types of training that will prepare workers for these trades. Specific training will be an economic necessity. In 1930, Snedden tells us, there were 200,000 automobile-repair mechanics helping to keep in repair 25,000,000 automobiles. Of these 200,000 scarcely 1 per cent had ever had any systematic training for their work. Snedden states that automobile owners wasted, that year, over $25 per car on worthless repairwork, a total of over $600,000,000 per year, or sufficient to have maintained excellent all-day vocational schools for nearly one million pupils.

The next task of education will be extremely technical and scientific. We must guide into routine occupations only those who find routine tolerable. Our techniques of selection must be improved and perfected, so that misfits may become a rarity; so that work involving the assuming of responsibility may be assigned to those who can shoulder responsibility. The philosopher cannot perform this task. The expert must discover the secret of positive, rather than negative, vocational guidance.

The expert's next great task will be that of devising the means of supplying the requisite training efficiently and economically. This should not prove difficult if we have a clear picture of what industry will be, and if vocational guidance can be made to function. What form this training will take, only time will tell. Since one guess is as good as another, a few conjectures are in order. The number of vocational schools or departments will be increased. A true vocational school in the future will attempt to provide facilities for the training of workmen by making possible actual participation in productive work. Snedden ventures the opinion that many schools will elect to lease such facilities from commercial concerns. Each pupil will bear the relation of apprentice to the school, just as boys were apprenticed in the day of the craftsguilds. The courses will consist of short units for the routine trades, and of longer units for those involving responsibility and leadership. It will be an evidence of intelligence if quotas are assigned to each field, so that every

worker may have an opening and so that no vocation may be flooded with workers.

Education's final task will be that of providing adequate mental resources for the vacuum created by routine and for the profitable use and enjoyment of added hours of leisure. Hence, vocational education and cultural education must dovetail their efforts. This problem does not exist in training for the professions. In such pursuits as law, medicine, or teaching, the personal and ideational aspects are strong. Each separate task is a delightful game, if the performer is properly equipped, through temperament and education. The machine worker is not so fortunate. Resources of thought and appreciation are lacking under our present industrial system.

Theodore Eaton, in *Education and Vocations,* has stated the issue very definitely: "Reading large meanings into simple things is one great function of education. The background in screw cutting or roof framing, in scientific and social implications, is sufficient to provide large meanings in such occupations. Education which is designed to give objective or material results only may be good education in a socialistic state wherein the individual is of value merely as a cog in the social machine; but in a democracy, where the life of the individual is of value in itself, it is bad education. A man who is a good productive mechanism, but not an understanding and appreciative producer, is no more a member of the democratic state than the machine he tends."

The solution to this problem lies in a careful correlation of cultural with vocational education. Workers, since they will not be needed in highly specialized vocations until relatively late in life, must attain fairly complete spiritual, cultural, and morale-conserving growth as a partial result of their training. Cultural education must prepare all persons to participate abundantly in creative, enriching, noneconomic avocations outside of working hours. This is cultural education's task, but it is vocational education's responsibility.

One may hazard a guess that the machine worker will, in the future, be taught geography, economics, mathematics, and several basic sciences, even though the work be done in a trade school. He will be taught the importance of his own department by being shown its relation to the other departments in the factory. Economics, sociology, and geography will teach him the lessons of the interdependence of all units of industry and society. He will thus become more acutely aware of his own contribution to the work of the world.

As far as is possible, he will be taught the romance that is hidden in the materials that he uses. He will be given a picture of the various queer corners of the earth where the article he helps to produce will eventually be found. Thus he will become a worker who endures work, not for the pay check, not for the leisure at the close of the day, but because he has identified himself with his job, and because he knows that his work is socially worth while.

Bruce Barton closes his book *What Can a Man Believe?* with an illustration that applies here.

"A gentleman, inspecting the construction of one of Sir Christopher Wren's cathedrals, asked each of three workmen, 'What are you doing?' One reply was: 'I am smoothing this stone.' A second said, 'I am working for ten dollars a day.' The third replied, 'I am helping Sir Christopher Wren build a cathedral.'"

The American ideal must be — every worker a cathedral builder.

Industrial Arts Today

Charles F. Bauder

Director, Division of Industrial Arts, Philadelphia, Pennsylvania

This material is taken from Mr. Bauder's annual report. Coming from a large city, it shows the typical situation in other large school systems. At the same time, it illustrates the value of industrial-arts work as a part of general education in our present civilization.

Enrollment Trends in Secondary Schools in Industrial-Arts Activities

Senior High Schools. Since 1930, enrollment in shop courses in senior high schools, comprising chiefly grades 10, 11, and 12, has grown at a much faster rate than has the total male pupilage. Shop elections rose from 4,788 in 1930 to 8,493 in 1934, or 77.4-per-cent increase. In the same period, the total male enrollment of these schools grew from 15,229 to 22,302, or 46.4-per-cent rise. Elections of shop-course curriculums reached 38.1 per cent in 1934, the highest to date. The increase in the past year amounted to 609, about 8 per cent. Similar figures obtain, if the junior-high-school data for grade 9 are included. Shop pupilage of grades 9, 10, 11, and 12 has increased since 1930 from 6,546 to 11,423, a rise of 74.5 per cent, whereas the total male population of these grades has risen 45.9 per cent, from 19,740 to 28,796. This large growth during the depression years is due largely to the nation-wide developments that have required young people to remain in school. The great popularity of the mechanic-arts and industrial curriculums reflects the demand of the majority of senior-high-school pupils for practical training toward useful employment.

Vocational Schools. These schools likewise showed a continued large growth in pupilage in full-time trade courses, with a decline almost to the vanishing point of employed continuation pupils under 16 years of age. The numbers in full-time trade subjects leaped 383 per cent from 339 in 1930, to 1,640 in 1934. The year just closed had a rise of 14.4 per cent, from 1,433 to 1,640. On the other hand, the effect of industrial codes and the outcry against child labor was evident in the drop in part-time continuation enrollment in shop courses since 1930 from 3,573 to 28 boys. The past year showed a decline in this group from 357 to 28. Boys who were formerly employed are back in school; those who would ordinarily have entered employment have remained in school.

Junior-High-School Grades. Junior high schools for grades 7, 8, and 9 increased about 3 per cent during the year as to male enrollment, from 21,228 to 21,841. These schools have now about reached the limit as to accommodations. In grade 9, where pupils choose a major line of studies to suit their general aspirations, the mechanic-arts curriculum grew in numbers from 2,717 to 2,930, a rise of about 8 per cent. Elections of this curriculum amounted to 45.1 per cent, the record up to this time.

Similarly, elementary schools retaining 7th and 8th grades because junior-high-school buildings are lacking, showed an increase in these grades of about 4 per cent, from 7,640 boys to 7,955. Practically all of these boys take shopwork as a

part of their training. The exceptions, amounting only to 1.2 per cent, are in small outlying schools remote from shop facilities.

Secondary-School Accommodations

The tremendous influx of pupils to senior high, vocational, and junior high schools during the years of the depression, has come too fast for the schools adequately to care for them, either in housing accommodations, or variety of offerings. This flood of youth has increased in heterogeneity of abilities and interests as well as in numbers. There is necessity for further adaptation of public-school facilities to the widening diversity of pupils' needs. But the very depression that has filled the secondary schools to overflowing has dried up the sources of funds that would be required for increased accommodations, additional teachers, and wider variety of curriculums. The necessity is particularly acute for new training facilities in vocational schools for the less able young people. These boys and girls formerly left elementary schools or early grades of junior high schools in large numbers at age 14 or 15, to enter employment in juvenile occupations requiring no special skills. They are not interested in academic studies; they are not well adapted to trade instruction which involves personal initiative and all-round skill. They are now in schools full time, until 16 or 18 years of age. New vocational courses should be found for them. Repetitive processes should be stressed, such as parts assembly, machine feeding, and quantity production in subdivided labor processes. Mathematics and science should be limited for the most part to the comparatively small functioning of these subjects in shop courses. English should consist largely in oral expression and reading practice, motivated by the occupational interest. The social studies should be taught in concrete units chiefly through projects. Textbooks for this group should have little place. These young people are as worthy of adequate schooling as any other group; their interests and abilities require adjustments in facilities.

More secondary schools are needed. Junior high schools care for about two thirds of the children of grades 7, 8, and 9. Their crowded condition requires that for the coming fall term many more 7A pupils be retained in elementary schools. Shopwork for these pupils has, however, been cared for in junior-high centers. Senior high schools are decidedly overcrowded; in most instances they operate two shifts of pupils and teachers. At least one large vocational school, to replace the inadequate McCall School, is imperative.

Administrative Economies

During the year, the Division participated in further economies in expenditures. One supervisor was detached and placed in a teaching position in a senior high school. Five auxiliary teachers were transferred to various schools, one to a vocational school, two to junior high schools, and two to elementary schools. Salary charges to the Division were reduced by $7,785 for the school year. The appropriation to this division for shop supplies in all schools was reduced about $11,000 for the first half of 1934. This represented a general cut in supplies allotments of 25 per cent from 1933 figures, made for all divisions. The reduction was particularly drastic for the industrial-arts activities, because it came at a time when shop classes were increasing in enrollment at a rapid rate. It is hoped that for 1935 the income of the Board will enable restoration of this cut.

Divisional Service in Instructional Material

In June, 1934, the Division completed a two-year study of junior-high-school courses in shopwork and mechanic-arts courses for grades 7 and 8 of elementary schools. Committees of teachers met on alternate Saturday mornings, under the chairmanship of supervisors of this Division, making analyses of instructional elements in woodwork, electricity, and metal work. Their reports have been issued to the schools in blueprint and mimeographed form, consisting of charts of manipulative and informational elements for the several grades, and suggestive lesson plans for the guidance of the teachers in leading class discussions. The form of the reports conforms to that suggested by the Committee on Standards of Attainment in Industrial Arts of the American Vocational Association, of which the director of industrial arts is a member. The analyses have attracted much attention throughout the country. They have been well received by Philadelphia principals and teachers.

Co-operation with Relief Agencies

The division shared in the excellent program of evening extension centers organized during the year by the Philadelphia County Emergency Education Relief Council. Twelve junior-high-school buildings were opened five evenings a week, six in the fall of 1933, and six more in the spring of 1934, utilizing the services of unemployed teachers and technical men obtained through the local state employment office. The shop courses were among the most popular offerings of these centers. They were organized principally to meet the avocational interests of men of the school communities. The students supplied their own materials for construction. Many of them developed latent abilities in the use of tools and materials, discovering talents that will be served in the evening and part-time technical and trade courses in their retraining for new crafts. Others whose knowledge of their trades has been narrow, have been aroused to the value of additional instruction which would tend toward greater continuity of employment. Among the important services of the extension centers was counsel to the students regarding the wide variety of vocational offerings in the evening high schools. The fine co-operation of the regular day teachers of shopwork and drawing with the new evening instructors merits special mention. They voluntarily spent much time with the new men to assist the latter in the opening weeks of the emergency centers.

The division was assigned to supervise the manufacture of furniture and other equipment for nursery schools, as another section of the Emergency Council's activities. Under the auspices of the Civil Works Administration, and later of the Local Works Division, 23 mechanics, a timekeeper, and a foreman were assigned to this office and placed in a vacant area in one of the former administration buildings. Hundreds of cots, chairs, tables, climbing ladders, and other articles suitable for little children and their teachers in experimental nursery schools have been constructed. They will be placed in service in emergency centers during 1934.

Exhibits of Senior-High-School Shopwork and Drawing

With the assistance of senior-high-school department heads and teachers, the division organized a fine exhibit of shopwork and mechanical and architectural drawing, placed in the exhibit room of the Administration Building during the fall and winter of 1933–34. It supplemented a similar display of elementary-school and junior-high-school industrial-arts work shown in the spring of 1933. Both of these exhibits were outstanding as a stimulus to principals and teachers, and a demonstration to the general public of modern teaching methods.

The annual Better Homes Exhibit, held in the Architects Building in April, 1934, included a commendable display of ornamental iron work and building models provided by senior high schools.

State and Federal Reimbursement

Vocational courses of certain types are recognized by the State Department of Public Instruction for partial reimbursement of teachers' salaries from state and federal funds.

A new national act was signed by the President in May, 1934, granting additional federal support for industrial education. The U. S. Office of Education is redefining many of the technical terms of the Smith-Hughes Act for vocational education, giving much more freedom than heretofore to states and cities to adapt vocational instruction to the needs of diversified groups of pupils. Philadelphia will benefit considerably from these two developments. New forms of industrial training can now be planned for without entailing complete absorption of the cost by the Board of Public Education, and the organization of a desired trade course will involve less restriction upon local authorities as to details.

Current Comment No. 10

Meeting Student Desires

Homer J. Smith

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How far the industrial-arts teacher is to go in allowing the student to choose what he is to make in the school shop, requires serious consideration. The author's thoughtful discussion of this question may assist many shop teachers in reaching their decisions.

TEACHER, do we have to do just what we want to do again today?" This is a question reported to have been asked by a youngster in an elementary-school grade. True or not, it suggests that even students themselves may not always appreciate the easiness or laxity of some recent educational plans. There is no intention here to berate things done in the name of progressive education. We have made clear gains by reason of such innovations as the activities program, the project method, and the socialized recitation. These have come in recognition of individual differences, and they serve to broaden the range of classroom experiences. They help in the discovery of special interests, in the development of initiative and resourcefulness, and in the encouragement of co-operative endeavor. They are, in the main, attempts to "break the lock-step"; they are based upon increased freedom.

Certainly, we want our students to find happiness in the shop and classroom activities. We want them to enjoy our presentations and their own supervised practice. We want them to be pleased with the learning projects and instructional jobs which we assign or which we approve upon their suggestion. We incline, naturally, to meet their desires. But, there is great difference among us as to the distances we go in attempts to have them satisfied. Some of us conduct classes and departments with rather full regard for what students are eager to do and to learn. Others, of opposite persuasion, make no seeming effort to meet their desires, but hold rigidly to a pattern of work considered by ourselves to be correct and appropriate. Still others, and these constitute by far the largest group, are between the two extremes in the planning and execution of their work.

These differing viewpoints and practices are, probably, born somewhat of our basic natures and personalities. Just as, probably, they are reflections of our preparations for teaching or even of the systems and ways under which we were taught as children. It would be interesting to secure from five thousand good teachers, in both industrial-arts and trade training, their several theories and experiences concerning this matter. The writer has formulated the following statements in the absence of such help and purely upon acquaintance with the special literature, and with the daily practice in classes and schools of various types.

On the whole, he feels that the school and the scheduled class are the place and the time for organized, well-planned instruction. There are other places and times for entertainment, for doing what one likes, and for making and fixing what one pleases. In the clubs, during after-school periods, in the home workshop, and while on vacation, would seem to be the best occasions for those interested in mechanical things to be engaged in meeting their own desires. What they learn in school will add to the pleasure as well as to the success of these out-of-school activities. Teachers that have the time and the inclination to assist boys and men in these extra-class projects will be rendering worth-while services, also, to their communities and the profession. But, much as we believe in well-ordered and teacher-planned instruction in the shops and classrooms, we must acknowledge that differences in types of schools and ages of students may justify different attitudes toward the value of pupil desires. It is more a matter of differences among schools and classes than of differences among students in any given class.

In the *six-grade elementary school,* where no special industrial teacher is employed, the regular classroom instructors often provide manipulative experiences in amplification of the general subject matter. By this concrete means, the pupils are led to attain growth through self-expression or through the learning of new things by the eye and the hand in supplement of reading and listening. Suggestions as to what things are to be handled, assembled, or formed at such times may well come from individual students. Notions as to what motor experiences would be most helpful or pleasant may also be conceived by whole classes. But, fundamentally, they will be arrived at by the teachers themselves, who are the only ones certain to know the real necessities or the most fruitful approaches. Student desires at this age can usually be met by the rather simple device of first creating the desires wanted for effective work in view of the objectives.

In the *junior high school,* where industrial teachers are in charge and where most boys participate in shop and drawing courses, we find a situation somewhat different from that in the lower school. Here we meet pupils of a very inquisitive, restless, and vacillating type. They want one thing, and immediately want another. As to the real purpose of industrial departments, they are uninformed and frequently mistaken. Most of them would be wholly content if the instructor would permit them to loiter and tinker without aim at instruction, except in incidental ways, and without check as to work completed. Left to their own devices, they would choose and make and spoil and break to the discredit of the instructor by his colleagues and patrons. And, it is questioned whether they would then be satisfied — whether, even then, their desires would have been met. It seems to the writer that the best way to attain the approval of immature boys, and the easiest way to do the most good, is to have a detailed and well-ordered course, and to insist that boys follow it closely. Now that instruction units are known for the elementary phases of most subjects, it is possible to assign appropriate and attractive projects upon which there may well be insistence for all members of a class. The time is so limited and the fundamentals so important that anything less than rigid

prescription can hardly be justified. Let instructors at this level be assured that they are right when they have assigned the projects that comprise the units that have been proved necessary and possible.

At the *senior-high-school* level, where courses are often elective and where an earlier subject experience may usually be assumed, we may take an attitude of less dictation. These boys are somewhat select as to interest in mechanical courses, and they may have definite leanings toward certain shops and work fields. They are more settled in their movements and thinking. The edge of curiosity has been dulled. More judgment is present, and more reason to respect it. Because of information gained in a wide variety of general courses, they have different interests and different desires. Many of them have abilities sufficient to carry out, with little extra assistance, some assignments at variance with the set proposed. Although a selected list of instructional units must here again outline the course, there is the opportunity and responsibility to match individual differences among pupils. One boy may wish and be able to construct what others should not attempt. One is ready to design in bold departure, while others may vary a detail, and still others must be held strictly to the print. One will be able to use a tool or machine or material or finish which cannot be placed in the hands of all who may wish to do likewise. Some can be trusted with extra work, and a small group, perhaps, with a co-operative job. This meeting of desires is a matter, at this level, of knowing and meeting abilities. By this means, a better course can be devised than would be possible under the strictness recommended for the junior school. If there has been good work in the preparatory years, the true aims of education and of industrial education will be more nearly fulfilled through latitude under close control.

In *trade training* we meet problems rather comparable to those of the general industrial work in this matter of student desires. Here, again, we must consider school aims and pupil maturity. In the long-term preparatory trade school it is assumed that students are beginners, unskilled and unversed in the ways of the craft. Here, then, at least in the first half or two thirds of the training, we should hold strictly to a set pattern of instruction. As the students near graduation, some leeway, especially that permitted by varied production work, is advised. In evening work of preparatory type, the same plan would seem to be best. But, in evening work of upgrading kind, where students are experienced, the recommendation is directly opposite. Of course, the instructor must be competent in the trade or vocation in question. Likewise, he must be able to prepare a course of study by bringing appropriate learning units into effective teaching order. Just as certainly, he must have an ear and an eye for the needs of his individuals. If he can build his course from the real desires of students, he will have attained the acme of good form. If he can teach so that each student knows that his needs are being met, he will have settled all his problems, and made of his work a real profession.

Student desires are worthy of our seeking, for purposes of curriculum building, of course construction, of management, and of method. They are particularly important with respect to the drills, projects, and jobs assigned. The use we make of desires should probably be a matter for our own decision, upon the basis of maturity, judgment, and experience differences among classes and then among pupils. Student desires and student needs are not to be confused. Our responsibility is to match needs. When we can, at the same time, meet desires, there will be greater satisfaction for all concerned.

Analysis of Machine Drawing

THE original of this analysis was submitted to 180 supervisors, directors, instructors in teacher-training colleges, mechanical-drawing teachers, and industrial draftsmen in the State of Michigan. Of this jury, 125 replied approving the statements with or without reservations, or proposing changes and additions. Such suggestions were considered by the committee in formulating the statements as finally agreed upon.

This analysis is the work of the Michigan Industrial Education Society Research Committee on Drafting.

The study was made by F. R. Kepler, Supervisor of Drafting, Detroit Public Schools, in co-operation with H. D. Campbell, Instructor in Drafting, J. Sterling Morton High School, Cicero, Ill., and a committee consisting of Edgar Roper, Supervisor, Manual Arts Department, Lansing, Mich., E. C. Russell, Director of Industrial Education, Pontiac, Mich., Richard Carlsen, Instructor in Mechanical Drawing, Hutchins Intermediate School, Detroit, Mich., D. A. Finger, Instructor in Mechanical Drawing, Pattengill Junior High School, Lansing, Mich., Osborn Stapert, Instructor in Drafting, Central High School, Flint, Mich., and Archie P. Nevins, Instructor in Drafting, Kalamazoo High School, Kalamazoo, Mich.

To satisfy the requirements for entrance into the field of machine drafting, a student should know and be able to do the following things and possess the related technical and vocational information.

I. Things the Student Should Know and Be Able to Do

1. Select, sharpen, and use appropriate pencils for lettering, dimensioning, and line work.

2. Letter notes and titles; space words, phrases, sentences, and titles; make whole numbers and fractions; use appropriate heights of letters and numerals for titles, subtitles, and notes.

3. Recognize drawing equipment by name and purpose; care for and use it understandingly, viz.: drawing board, T square, triangles, scale, compasses, dividers, bow instruments, ruling pen, erasing shields, irregular curve, protractor, lettering pens.

4. Place and fasten drawing paper to the board.

5. Lay out standard drawing sheets including border lines and the title block.

6. Use the standardized alphabet of lines: visible edge, hidden edge, dimension, witness, reference (leader), center, section, construction, alternate positions, adjacent part.

7. Make projections of views and know their names, locations, and interrelationships, in third-angle projection.

8. Make dimensioned, freehand shop sketches in third-angle projection.

9. Block out views for proper balance on sheet, at first by measurement; later, approximately by eye.

10. Make penciled drawings following an effective order, as: laying out sheet, including title, blocking out arrangement and location of views, blocking in views and details (shape description), dimensioning, and lettering notes.

11. Dimension working drawings to satisfy practical requirements for clearness and utility.

12. Draw intersections of solids and voids, such as are commonly found in castings.

13. Make surface developments and intersections of typical sheet-metal forms.

14. Draw machine parts involving oblique projections of circles.

15. Draw auxiliary views projected on a plane normal to one of the planes of projection.

16. Follow printed directions in applying useful geometrical constructions to drawings of machine parts as: (*a*) Bisect a line. (*b*) Divide a line into a given number of equal or proportional parts. (*c*) Bisect an angle. (*d*) Construct a hexagon,

the distance across the points or across the flats being given. (*e*) Construct an ellipse by an approximate method, and by an accurate method such as the concentric circles method. (*f*) Construct an angle equal to a given angle. (*g*) Construct a triangle equal to a given triangle. (*h*) Divide a circumference into any number of equal parts. (*i*) Draw an arc tangent to two straight lines at any given angle. (*j*) Draw an octagon, given either the diameter or one side. (*k*) Construct a helical curve.

17. Represent materials by uniform cross-hatching accompanied by a note and, with the aid of handbooks, by the appropriate conventional symbols.

18. Represent breaks by the generally accepted conventional method and forms.

19. Draw true and conventional sections of details and assemblies including full, half, partial, and superimposed (revolved) sectional views.

20. Represent visible and invisible threads conventionally in plan, elevation, and sections, including tapped and threaded holes and externally threaded parts.

21. With the aid of handbooks, draw hex- and square-headed bolts and nuts; taper and cotter pins; washers; rivets; welds; keys; studs; cap, machine, set, and wood screws; and other fastenings, in assemblies and in sectional views of assemblies or partial assemblies involving such standard parts.

22. Draw common machine details, such as pulleys, couplings, bearings, handwheels, T slots, dovetail slides, ball cranks, eccentrics, pistons, etc., from pictorial drawings, from layouts, and from actual parts to give practice in making working drawings similar to drawings of industry.

23. Use handbooks, reference books, catalogs, and data sheets.

24. Make drawings full size and to scale as: two times or double, four times or quadruple, one-half, one-quarter, and one-eighth size.

25. Indicate rough and smooth machined surfaces, ground, filed, etc., by means of appropriate conventional symbols or by means of notes.

26. Make notations on drawings regarding finish, machine processes, fits and tolerances, material, heat treat, and analysis of material.

27. Make detail drawings of actual machines and machine units from dimensioned shop sketches, assemblies and full-sized layouts.

28. Assemble dimensioned details into assembly, and subassembly drawings, using views with hidden lines and true or conventional sections.

29. Make penciled drawings on tracing paper such as bond or vellum in an effective order and with a technique that will secure a clear print.

30. Make inked tracings on cloth and on paper such as bond or vellum in an effective order and with a technique that will secure a clear print.

31. Erase ink lines or spots with a minimum damage to the surface of the paper or cloth.

32. Check drawings for clarity and accuracy of views, dimensions, notations and specifications, for form and contrast of lines, for general appearance.

33. Measure machine parts with calipers, machinist's rule, and other measuring instruments as may be required by conditions.

34. Follow drafting-room practice in squad organization, layouts; material lists; material specifications; numbering of drawings and patterns; filing of drawings, tracings, data; engineering changes; care and use of blueprinting machinery and paper.

35. From specifications and empirical data, lay out such gears as spur, bevel, and worm showing the profiles of not more than three teeth of a single gear. In the case of mating gears the profiles of only those teeth which are fully or partially engaged need be shown.

36. Use approximate arc (adontographic) involute and cycloidal methods of drawing the profiles of involute, stub, and composite (interchangeable) gear teeth.

37. From specifications and empirical data, lay out such cams as plate, face, cylindrical.

38. With the aid of handbooks and empirical data, lay out machine units designed to transmit power other than by gears and cams such as: flat and V belts, chain and sprockets, etc., to meet specified requirements.

39. With the aid of handbooks, catalogs, and other data, design equipment, and simple tools, jigs, fixtures, and machines.

40. Lay out simple punch-press dies.

41. Make pictorial representations of fairly simple machines, parts, layouts:

a) Dimensioned cabinet drawings, including sections;

b) Dimensioned isometric drawings including sections;

c) Freehand line perspectives of machine parts, from objects and from drawings in third-angle projection;

d) Mechanical perspectives.

II. Related Information

1. How to safeguard sight and general health.

2. An understanding of patternmaking and founding as applied to simple machine drawing and design.

3. Elementary understanding of common machine operations, such as: boring, drilling, reaming, turning, shaping, planning, knurling, grinding, countersinking, counterboring; and also of heat-treat hardening, tempering, casehardening, annealing, chilling.

4. Common characteristics of such materials as: cast iron, machine steel, tool steel, aluminum, brass, bronze, babbitt, die-cast metal, and similar machine materials.

5. Knowledge of standardization in manufacturing and methods of interchangeable-parts manufacture, and their relation to drafting, tolerances, die casting, drop forging, punch-press work, automatic screw-machine work, and the like.

6. Knowledge of the historical origin and significance of the N. C. (national coarse) and N. F. (national fine), formerly the U. S., A. S. M. E., and S. A. E., standard thread systems.

7. Such knowledge of mathematics and science as is required in detailing and designing machine parts, jigs and fixtures, involving arithmetic, algebra, geometry, trigonometry, physics, metallurgy, use of practical formulas, figuring the weight of castings and other machine parts.

8. Characteristics of pencils, erasers, and drafting ink; of detail, tracing, and blueprint papers.

9. Knowledge of the reproduction of drawings by means of blueprints, blue-line prints, positive and negative brown prints, ozalid prints.

10. Knowledge of the characteristics and uses of such special industrial-drafting equipment as lettering devices, parallel rules, parallel attachments, beam compasses, universal drafting machines.

11. Occupational information: success factors, income, and opportunities.

12. How to apply for a job including a letter of application. Importance of good appearance, manners, English, and dependability.

13. Acquaintance with periodicals relating to drafting.

14. Acquaintance with the publications of the American Standards Association.

15. Acquaintance with draftsmen's and engineer's societies, their activities, qualifications for membership, and dues.

Arguments for Industrial Arts

Ross C. Cramlet

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Des Moines, Iowa

Fifty reasons to show why industrial-arts work should be part of our system of general education.

INDUSTRIAL-arts education and its relative value in the school curriculum has been a topic of considerable discussion during the past few years. Of course, there is little doubt on the part of the teachers in that field as to the comparative benefits that may be derived from such education in public schools. The most common demand on the part of the critics of education today is that it must be made practical and relate well to the actual experiences of life.

Each of the following statements offers an argument which shows the value of industrial-arts education as it is taught in the best schools today.

1. It will develop interest in and an understanding of our good mechanical magazines of today.
2. It will develop the individual's understanding of drawing, which is the graphic language of this mechanical world in which we live.
3. It will increase the resourcefulness of the individual.
4. It will develop an understanding of materials and their behavior during the time they are being processed.
5. It will familiarize the student with common commercial terms which are used in purchasing many common commodities.
6. It will give a historical background of the development of many of our common tools. (In order to provide this, suitable films are available from many tool manufacturers.)
7. It gives a conception of many common materials, their origin, their manufacture, and the industrial processes required to make them ready for use.
8. It will enable the mature mind, in years to come, to appreciate the mechanical sense of every normal boy, his desire to create, and the satisfaction which he derived therefrom.
9. It will direct the mechanical interest in a boy, and enable him to carry on a wholesome activity in the home, thus making homelife more appealing to him. (If the church, the school, and the home are the foundations of a stable society, should not the home have some type of constructive program for its young people?)
10. It will encourage habits of thrift.
11. It relates well to the seven cardinal principles of education which are held in high esteem by educators.
12. It will stimulate the type of thinking involved when actual accomplishment and not theory, is the goal.
13. It necessitates putting into operation factual information.
14. It will impress upon young peoples' minds the importance of maintaining and giving proper attention to many household appliances.
15. It will cause the prospective buyer to look for quality.
16. It will stimulate an understanding and appreciation of design.
17. It will give the student an understanding of the steps necessary to restore furniture properly.
18. It will impress upon the student's mind the cost involved when it is necessary to purchase all materials.
19. It will give him an idea as to where to purchase many common articles and what they are likely to cost.
20. It teaches the boy how to work where actual physical exertion is involved.
21. It will teach the boy how to sharpen and care for edged tools.
22. It will give an idea of how many commodity values are determined. For instance, lumber is sold by the board foot, nails are sold by the pound, iron by the pound, screws by the gross, etc.
23. It will relieve any fear a boy may have of attempting to do jobs of work which may require considerable time.
24. It adds, in many cases, to a boy's patience.
25. It will enable him to handle paints, oils, fillers, and stain with care and precaution, so far as equipment is concerned.
26. It will aid a boy in acquiring satisfaction derived from orderliness.
27. It will increase his courtesy in common relationships (much of this depends on the instructor).
28. It will increase respect for another's property.
29. It will increase his ability to care for a number of material things without loss due to the extra precaution he will exercise for the things he prizes.
30. It will teach him how to respond to a routine of organization after having participated in an informal type of activity. (Is it not typical of every boy to knock one more fly in the ball game after the bell has rung?)
31. It gives a general knowledge of industrial processes, relationships, and materials; provides opportunities for exploratory purpose; and develops appreciation for materials.
32. It will stimulate interest, and develop self-reliance.
33. It will stimulate mechanical aptitudes which are not made evident by other types of academic work.
34. It will foster an understanding of the scientific principles underlying the operation of many mechanical and electrical contrivances with which we are surrounded.
35. It will assist the prospective consumer in making the proper selection from the large variety of things offered for use.
36. It will stimulate interest and resourcefulness which will lead to the profitable use of leisure time.
37. It offers an informal type of activity which is similar to activities of actual life.
38. It will develop a spirit of co-operation and ability to work with others.
39. It will develop those resources in the individual which will make him a so-called "handy man."
40. It will stimulate creative thinking.
41. It will develop physical and mental co-ordination through the use of the hands, and will in many cases lead to manual skill.
42. It will bring out interests which may lead to the training of a definite vocational type.
43. It will develop good personal and social habits, respect for others, and respect for property not owned by the individual.
44. It will stimulate the proper attitude toward organized work.
45. It sets up an opportunity to develop hobbies.
46. It offers an opportunity for practical application of academic subject material, mathematics, English, botany, physics, etc.
47. It will teach appreciation of good workmanship.
48. It will teach sportsmanship in cases where competitive exhibits are held.
49. It will enable the boy to develop designs and working patterns so commonly found in the current magazines.
50. It will give an understanding of the origin and preservative qualities of the many finishing materials.

Auto Mechanics

Drew W. Castle

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The author gives suggestions that ought to be considered by everyone who is determining the subjects content of any one of the numerous industrial-arts courses now taught in junior and senior high schools.

IF EDUCATION is training for life, and the automobile has become an intimate part of our living, then no one can deny that this machine should be recognized in our school curriculums. It will not be far from the truth to say that some day every high-school boy will own and operate a motor vehicle. If we require him to learn Boyles Law, the Pythagorean Theorem, that "amo" means "I love," etc., all because sometime later it will enable him better to understand a life situation or to solve a problem, surely we are justified in teaching him something about the machine that will offer problems for him to solve while furnishing the transportation that he will need and demand. If any one machine has thoroughly and intimately tangled itself in the everyday life of twentieth-century Americans, that machine is the motor vehicle.

It is pleasing to report that most modern senior high schools include the industrial-arts subjects in their curriculums, and that auto mechanics is a sizable proportion of this subject matter. I doubt that many of these auto-mechanics courses are prewar developments. For the most part, they found their way into the family of secondary-school subjects during the rapid postwar expansion of curriculum offerings

in the American high school. Being such a young member in the household, they have yet to be treated with much of the scrutiny of curriculum studies. As a consequence, the course content and organization have remained almost unchanged throughout this infant period.

Is it not time for us to examine critically our auto-mechanics courses and evaluate them with the measuring stick of educational needs?

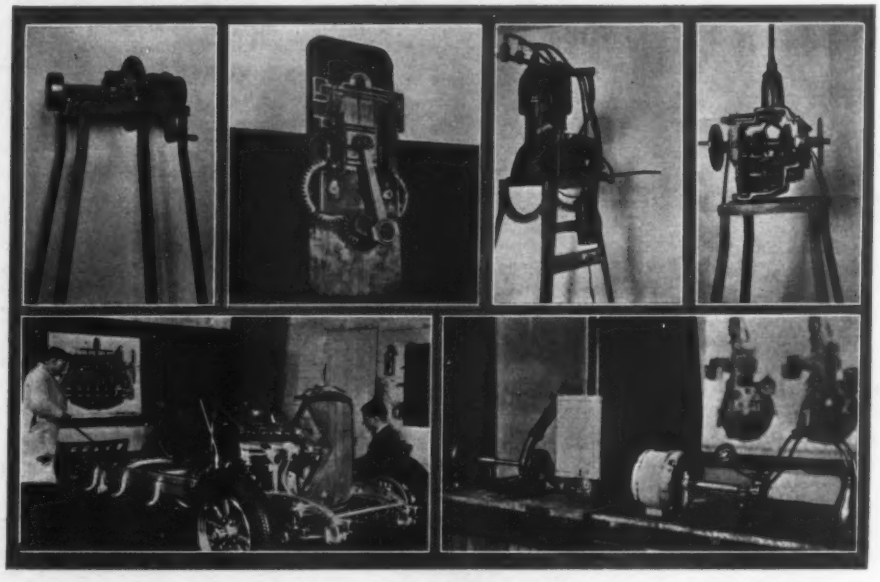
The typical auto-mechanics course is a separate unit located in a shop in which the instructor teaches automobile theory and repair practice for a semester, or a year, and even longer. Pupils are actively engaged in the study of the construction, operation, and repair of automobiles. In these shops, one always sees pupils spending quite a large portion of their time manipulating tools. If the school offers this course with the intention of teaching auto mechanics as a trade, this activity is, of course, the backbone of the training and is intensive; but for the vast majority of high schools offering this intensive repair-activity course as a part of the general education of its pupils — well, let us see if it can be justified.

It is fair to assume that the youth of high-school age is going to use the knowledge acquired in the schools in much the same way that the adult is at present using his knowledge. Relative to automobiles, the statistics tell us that in 1930, 394,169 men earned their living with their knowledge of automobile-repair practice. In the same year, 23,059,000 motor vehicles were registered in the various states. This does not include government and state-owned vehicles that were not registered. Based on the assumption that every motor vehicle has a driver, it is safe to conclude that there are at least 50 drivers to every mechanic. Are we justified, then, in teaching repair practice to all of our pupils in high-school auto-mechanics shops, when the chances are that only one of 51 will use this skill in the practice of the trade of auto mechanics? By having such a long and intensified course, it is impossible to provide for all of the pupils the training that they should have as safe consumers of automobile transportation. Is it not better to offer the many the training they should have in this field, rather than intensify the instruction for the few, a small proportion of whom will have use for so much knowledge and ability?

It seems advisable, therefore, to provide a short course in auto mechanics for all high-school boys as a part of a general-shop course, designed to make them safe and intelligent consumers of automotive transportation.

After a course of this kind, the few who wish to specialize, can be provided for in a trade school, or in the same institution through a specialized course. But the consumer objective in the general course should not be shelved for these few.

Six or eight weeks is the ideal length of time for short industrial-arts courses. The outline that one might prepare for one will fit the other or even a longer course. It matters not so much how the divisions of the teaching matter are made. Practically all auto-mechanic outlines look very much the same. The method of presentation is the feature that distinguishes one course from another.



Illustrative teaching material

The content of an auto-mechanics course that fits the objective stressed in the foregoing, is outlined in the following units:

1. Bodies
   - Types
   - Construction
   - Safety features
   - Streamline principles
   - Care
2. Chassis
   - General description and function of major units
   - Frames
3. Engine
   - Operation
   - Construction
   - Probable service needed
4. Lubrication system
   - Types
   - Care
   - Oils
5. Cooling system
   - Control of temperature
   - Seasonal attention
6. Ignition system
   - Operation
   - Probable service needed
7. Fuel system
   - Carburetors
   - Fuel pumps
   - Air cleaners
   - Air silencers
   - Automobile fuels
8. Car wiring and lighting
   - Safety features in design and arrangement
9. Clutch
   - Operation
   - Care
10. Transmission
    - Lubrication
    - Operation
11. Drive shaft and rear axle
    - Lubrication
    - Operation
12. Front suspension
    - Principles of easy riding
13. Steering gears
    - Operation
    - Geometry
14. Brakes

Safety features
Probable service needed
Care
15. Chassis lubrication
16. Tires and wheels
Care
17. State and local motor-vehicle laws
Computation of horse power
18. Automobile safety
19. Automobile insurance

At least one week should be devoted to items Nos. 17, 18, and 19.

Published text material must be supplemented by current automobile sales literature, owners and service manuals. Something new is being introduced every year. This fact makes it imperative that the teacher use an immense amount of supplementary material. An elaborate notebook required of all the pupils is also essential.

The main feature of this type of course is that the emphasis is placed on an understanding of the construction, operation and care of the vehicle. Repairing is not included, except insofar as it relates to knowledge about service likely to be needed at the various mileage ages of the automobile, and how the owner can purchase this service intelligently. To impart this knowledge, it is not necessary to ask the pupil to acquire skill in performing these service operations. If this skill were demanded, no time would be left for the more important parts of the course.

A teacher offering a course such as this will make great use of demonstrational equipment. The limit of his ingenuity is the only limit to this important part of the course. The recent exhibition material at automobile shows, and at the Century of Progress, has furnished the schools an example of demonstrational equipment that they might well attempt to imitate.

Last, but by no means least, it may be stated that if we are able to induce our pupils to assume an attitude of intelligence toward the problem of safety in automobile transportation, we will be making a great contribution toward the complete secondary education of our youth. Everybody feels the influence of the automobile. It is unique in this respect. But the cost in lives and money of the accidents that are caused by this machine is rapidly approaching that of war. There is little difference between the drain on our resources caused by war and by automobile accidents. Training pupils only to repair automobiles will reduce this tremendous loss very little, if at all.

Guidance in a Boys' Club

Robert C. Colangelo

Worcester Boys' Club,
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Guidance, when well done, has worth-while results, whether it be the result of the efforts of the school, or of some interested teacher, or of a boys' club leader.

A GUIDANCE program cannot be successful without a thorough understanding of the classes of people to be guided and their immediate environment. With this as a basic principle, the first step in organizing the guidance department in the Worcester Boys' Club was to become familiar with the various activities of the boys, and then to learn their reactions, abilities, and needs. When the director felt that he knew pretty well the class of boys with whom he was to deal, he devised *The Worcester Boys' Club Guidance Card* which is the basis of all guidance activities. In addition, a list of 150 major occupations, with 40 subdivisions, was made. The attention of the boys is directed toward this list. Upon their request, any information they desire concerning any of the occupations listed therein is made available to them. Later, a school report form and a self-analysis blank also were devised. These are used to gather valuable information about the boy's schoolwork, and about his impressions or opinions of himself. This analysis provides the youngsters with something to think about.

It may seem unessential to ask the boy for a full history of his parents, sisters, and brothers; but in order to know a boy thoroughly, something should be known about his family. The occupations of his nearest relatives will have a great bearing on his choice of a vocation. Then if he has a greater inherent ability than is evidenced by the occupations of the members of his family, he should be encouraged to use that ability to the fullest extent possible.

During the past year, the first that this department has been in operation, a total of over 300 boys were studied. In each case a certain program was mapped out for the individual to follow, working on the belief that a boy with his eyes fixed on an attainable and worthy goal makes a more commendable and responsible member of the community. Consultations were held with a large number of parents in order to ascertain their wishes in regard to their boys' future, and to determine, more or less, what they expected and desired of their children. It seems essential that parents ought to play a large part in shaping the future of their child or children.

In the interviews with the boy, it is the aim to learn as much as possible about his past history, his interests, desires, and ambitions; and above all to gain his confidence. If it is found that the boy has a certain inclination or desire toward a particular vocation which seems worthy and suitable for him, considering his own ability and possible attainment, he is encouraged in every way to pursue investigation further. To this end he is given as much information as possible on his chosen field. He is informed as to the nature of the work which he has chosen, its advantages, and disadvantages, the qualifications and training needed, remuneration, future possibilities, and so on. Then he is referred to certain books on the subject. In many instances he is put into one of the classes, such as printing, woodwork, carpentry, electricity, mechanical drawing, journalism, office practice, bookkeeping, sheet-metal design, commercial arts, or handicrafts, where he receives some fundamentals and a general concept of the whole field.[1] The instructors in these classes are specialists in their lines and have had considerable training in pedagogy and boy psychology. At least once a month every teacher takes his entire class to visit some industrial plant for first-hand information on the subject. In addition to these classes and trips, a class in occupations is conducted, and once a week successful business and professional men are invited to talk informally to the boys — both individually and in groups — to tell them about particular lines of work.

If the boy has no well-defined aims, or if he has any that are suitable to him, we try to arouse his interests in fields which seem to fit better. He is permitted to try out as many courses as he chooses. If there is no class offered in the sub-

[1]For a detailed discussion of these classes, see "How a Boys' Club Helps" in the *Journal of Education* for September 14, 1931.

ject that he has chosen, arrangements are made with his school to change his program so as to include the desired work, whether it be given in public or private institutions. The boy also is urged to consult with prominent men and women successfully engaged in the various professions and trades. In short, he is given all the necessary assistance to bring him to the realization of some definite purpose.

It takes several interviews, and usually a number of days, before all the necessary data concerning the boy's ability, habits, school records, accomplishments, and general behavior are gathered. After all of the information has been secured, a tentative program is mapped out as a joint effort between the director of guidance and the boy. This program is always looked upon as being in a state of flux, as there are oftentimes unforseen factors that warrant a change. Successful guidance cannot be accomplished overnight. It must be a continuous process.

The plan of guidance follows more or less the steps set forth by the National Vocational Guidance Association. In a boy's club, however, there are no school laws or other regulations. A boy joins the club because it appeals to him. His surroundings must be made as informal and attractive as possible, and he must be made to feel that he is in his own world of ideals and realities. Then while in the club, he usually becomes interested in one or more of the prevocational and vocational courses, and he enters these because *he wants* to. He comes to the club leaders with his difficulties because *he knows* that they will do their best to help him. He knows that they are his friends, and that they will gladly do whatever they can for him.

Most of the boys that register for guidance are brought in contact with the director of guidance indirectly at first. For instance, there is the boys' sight-seeing club with a membership of about 75 boys, varying in ages from 10 to 18. Once a week — usually on Saturday mornings — the members of this club are taken to visit some industrial or commercial plant in the city or in one of the neighboring towns. The boys frequently do not know that this is a scheme to acquaint them with the vocational opportunities offered by their own community. They merely go out to have a good time. Every Saturday, however, a number of them stop in the office after the trip, and ask numerous questions about the particular place visited. They are interested in some of the things seen. They begin to wonder how they can do the same things; and are eager to find out how they, too, can become draftsmen, engineers, mechanics, bakers, plumbers, and so on. This gives the director a chance to impart the much-needed information. The results are surprising.

The aims of the guidance program are to:

1. Help the boy discover his own abilities and interests and know himself.
2. Guide him through school, so as to avoid failures, and the consequent development of inferiority complexes, and to have him remain in school as long as possible.
3. Provide him with information about occupations, and lead him to choose a vocation as high as his own abilities warrant.
4. Arrange a program for him so that he will receive the training necessary for his chosen field.
5. Make a comprehensive study of the industries in this community, and establish contacts with firms.
6. Help the boy find a job in which he has received training. (Care must be taken that the job offers a future for growth.)
7. Follow up the boy in his work, and help him make any arrangements and adjustments necessary for his success and happiness.

In order to show how the department is working, perhaps it would be interesting to present some of the results achieved so far. In reviewing these results — if they can be called results in the short time the work has been carried on — it must be remembered that guidance is not an action or deed than can be accomplished instantaneously, but rather one that is a continuous and growing process.

CASE I

Leonard S., 15 years old, eighth grade, junior high school. Mentally below average, and physically handicapped. He is small, thin, and hunchbacked.

When Leonard came to the department he was very discouraged, and ready to leave school. He didn't like his teachers, and "hated books and writings of any kind." He had no interest in anything. He was very despondent and irritable. His parents complained of his behavior, and his teachers "couldn't do anything with him."

He was talked to in a friendly way, and his confidence had been won after seeing him every day for a week. He knew more about himself than his teachers or parents realized. He felt that he was handicapped physically, and was sure that there "was no salvation for him."

After several interviews Leonard decided to enroll for the printing course, and try to follow that line of work. He entered the beginners' class, and in less than three months had been promoted to the advanced group. He attended school regularly for the remainder of the year, and finished with grades better than the average. During the summer months he worked in a printshop as office boy, and in the fall entered the establishment as an apprentice. Today he scarcely seems the same boy. He is very happy in his work, and is well liked by his superiors and fellow workers. Two evenings a week he comes to the club printing class, and then goes to trade school three other evenings.

CASE II

Thomas P., 16 years old, ninth grade, junior high school. When Thomas was brought to the attention of the guidance department, he was ready to drop school. He is big for his age, and felt out of place among the younger boys in his class. At the time he saw "no use for continuing school," for he said, "I will have to go to work at 'anything' sometime anyway, so might as well start now."

When interviewed, it was noticed that he kept on playing with a pencil, and drawing figures on a piece of paper on the desk. Upon further questioning, he answered that he "liked drawing some." He was then asked if he did not want to enter the mechanical-drawing class. At first he seemed reluctant about it, but after it was explained to him that there was very little discipline in the club's classes, and that he could do just as much or as little work as he wanted, he decided to try it.

Thomas graduated from junior high school last June, and now is preparing to enter Worcester Polytechnic Institute and become an engineer. He is doing very good work both in high school and in the boys' club; and it will be interesting to see what he will do four or five years from now.

These two cases are samples taken at random from the files. They indicate the trend toward which the department is working, and clearly show the need of guidance among adolescent boys.

A "Dutch Colonial" house built to scale, by the High School Vocational Department, Greensboro, Maryland. V. E. Rathke, Instructor

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Let Your Light Shine

In the March issue of the *American Boy,* Robert C. Mill gives a short account of how Gerald A. Boate of the John Marshall High School, Seattle, Washington, inspires his students to make useful articles of many kinds out of stray pieces of material salvaged from the city dump heap.

It is pleasant to read this short item because, first, it acknowledges the good done by a man whose name is quite familiar to the readers of this magazine. Second, it shows that the efforts of one teacher may, and often do, call forth the approbation or the disapproval of those not directly connected with schoolwork.

It is a fine thing that the article in the *American Boy* is commendatory. It impresses a certain number of that magazine's readers that a shop teacher has done something worth while. Unfortunately, had the article been derogatory, many more magazines and newspapers might have noted it, and broadcast it to their readers.

Individually, one may feel that one's actions make but little impress on the sum total of man's accomplishments. Yet, here is an item published in a magazine printed in Chicago, describing the activities of a teacher in Seattle, which is read by boys and men in the cities, towns, and hamlets of our country, and even beyond.

It is publicity such as this that apprises the world of what the hard-working, quietly planning, unostentatious shop teacher does in his classroom to help meet conditions as they are. Many of our readers may say, "What Boate is doing, I have been doing this long while." Righto — does your town know about it? Has your work with the boys in your shop led the jobless men, looking for something to while away time that seems to move at a snail-like pace, to look for junk which might be worked over into useful things for the home? Has it made your boys and the men just mentioned look at this junk with an appraising eye and an inventive mind?

If it has done these things, you have done a real teaching job, if not, you have done but half a piece of work, no matter how well your boys transform "junk" into something they can use.

For years the world has looked upon America as a squandering nation which threw away more than it used. Mr. Boate and many other shop teachers like him, under the stress of the times, have begun to inculcate ideals of thrift and economy of materials, by turning discarded materials into articles of use and worth.

Incidentally, there are those who will say, "Why all this publicity-seeking and grandstand play?" Shakespeare said "The evil that men do lives after them; the good is oft interred with their bones." It is not only necessary that teachers do not do evil, but if their work is to do real good, they must see to it that the good they do is known. Had that been properly attended to, industrial arts and vocational education would not have been looked upon as merely an expensive appendage to general education during these trying times.

Mr. Boate is to be complimented. He has done a fine piece of work with his boys; he has, through them, reached the parents; he has shown other teachers how easy it is to carry on under reduced budgets if one really wants to put his mind and energy to it; and he has demonstrated to the layman the value of the often-maligned shopwork in the school.

Knowing The Law

On the lawbooks of many states there are definite provisions for the establishment of departments of industrial arts and vocational education in certain schools of cities above a certain size. In some instances, there are stipulated methods of procedure required to inaugurate these courses in the public school.

The State of Illinois, for instance has a statute upon its books known as the "Illinois Manual-Training Law," which reads as follows:

Sect. 105. Upon the petition of not less than fifty voters of any high-school district, filed with the township treasurer at least fifteen days preceding the regular election of members of the board of education for such high school district, it shall be the duty of the treasurer to notify the voters of such district that an election "for" or "against" the establishment of a manual training department for such high school will be held at the next annual election of the board of education by posting notices of such election in at least ten of the most public places throughout the township for at least ten days before the day of such regular election which notice may be in the following form, to-wit.

HIGH SCHOOL ELECTION

Notice is hereby given that on Saturday, the . . . day of April, 1 . . ., an election will be held at . . . for the purpose of voting "for" or "against" the proposition to establish a manual training department for the high school in township No. . . . range No. . . . The polls will be opened at . . . o'clock . . . M., and closed at . . . o'clock . . . M.

. . . . . .

Township Treasurer

The ballots for such election shall be canvassed as in other elections, and may have on them the names of the persons voted for at such election. If a majority of the votes cast shall be in favor of establishing a manual training department for the high school in such district, it shall be the duty of the board of education to establish and maintain therein such department as a part of the high school.

In the course of time, some of these statutes are forgotten, to the detriment of those who are now attending school. It is the duty, then, of all who are interested in industrial arts and vocational education to be fully informed on all state and federal laws pertaining to their field of education. It may, in some in-

stances, settle disputed points when school building programs are being discussed. It is much better that definite provisions be made for the required shops before, rather than after, a school building has been erected. Then, too, our present civilization demands so much of what industrial-arts and vocational-education courses can give to the student, that the youth of our country should not be denied obtaining all of this type of education that the law provides.

A Question of Ethics

Again and again, teachers in general and shop teachers in particular are branded as sample snatchers, catalog hunters, and information poachers. It is true, the ambitious shop teacher must ever be on the alert for illustrative material, informatory material for his related-subjects lessons, samples of various kinds, explanatory drawings, illustrations, and the like. He must, of course, take this where it is obtainable, yet there are certain decencies to be observed in getting this material.

Many manufacturers and dealers who sell their goods to the school shops are more than generous with their free samples, instructional materials, catalogs, and similar items. The teacher must not forget, however, that these things cost money. In some of the free items, the cost runs up to really astounding figures. There are catalogs, distributed gratis, that cost more than some of the reference books found in the school shop. A catalog, however, is looked upon as something of very little importance. It may be, and often is, cut up to furnish illustrations for a lesson or a test sheet, or because the teacher wants to order something without writing any lengthy explanation. The mutilated copy is then thrown into the wastebasket and a request is sent out for another catalog.

It is the same with samples of materials. These, too, cost money, at times as much as a dollar per set. If they are used in the proper manner, the firm sending them out will eventually profit from them. If not, they, too, will soon find their way into the scrap box without benefiting anyone.

Then, there are some teachers who not only write for samples, catalogs, and what have you, but they encourage their students to do the same thing. In each case, the material sent out represents value. The firms sending it out, charge its cost to advertising, and as such it becomes part of the cost of the merchandise bought by the bona fide users. True, there are some large manufacturers who will gladly spend great sums of money on educational projects, yet even in writing to these, it is only ethical to state the conditions which make the request necessary, and not pose as a potential purchaser when the prospects for this are practically nonexistent.

Then, there are teachers who go even further. They write for catalogs so that they can copy the designs which someone else has devised at an expenditure of much time and money. Others write to firms from which they have never bought a cent's worth, and ask for information that may require hours of someone's time to collect, without inclosing as much as a stamped envelope.

Some writers for professional magazines claim that they have sent out ten to fifteen dollars' worth of mimeographed materials upon the request of teachers, who, in return, did not contribute as much as the postage required to send the information asked for.

All of the things mentioned may seem trivial if considered in connection with but one individual. Shop teachers, however, are numbered by the thousands in this land of ours. They have, or ought to have, much to do with the training of character. They must do their part of inculcating ideals of honesty, justice, and fair play in the youth of America. To do this well, they must practice what they preach — and the matter of making use of the things expected to be got for nothing from those who sell their wares to the schools is just one of the items where teachers can practice the professional ethics which ought to be part and parcel of everyone called to the high office which they hold.

Safety Always

The idea of the safe use of hand and machine tools and other equipment in the school shop must be continually kept before the student's mind. To do this, every kind of device should be used.

First of all, the method of keeping and storing tools in the school shop should be such that accidents can be avoided as much as possible. Edged tools should be suspended in such a manner that the student cannot readily injure himself or others when he removes them from case or rack. The tool racks on the benches should be so guarded that a boy stooping to pick up something near the bench cannot injure himself as he comes out of his stooping position.

All machines should be thoroughly guarded. In this respect the school should be more careful even than industry. Wherever there is a state safety inspector for factories, he should be especially invited to make periodic inspection trips through the school shops, and then asked to render a report of his findings and recommendations.

The floor around machines occupied by the operator ought to be rendered safe against slipping, either by special floor treatment or by some type of covering. Definite areas also ought to be marked out as safety zones around each machine, beyond which no one but the operator of the machine is to be allowed at any time.

In order that the idea of safety be further impressed on the student, special recognition of one kind or another should be given to those students who go through a month, semester, or year without accident or violation of safety rules. All of these methods have been found helpful by some safety-minded shop teachers. Their adoption by others can only make the teaching of safety more effective.

Common Woodworking Tools—VI

E. M. Wyatt

West Technical High School,
Cleveland, Ohio.

The sixth serial on the development of woodworking tools.

THE CHISEL AND GOUGE

AMONG the stone implements from the Polished-Stone Age are frequently found some similar to those illustrated in Figures 61 and 62. These have been called chisels and gouges, as their shapes indicated that they could be used for the purpose for which we now use such tools. We cannot be too sure that these names are entirely appropriate, for when tools were few, their uses were likely to be many. The implement shown in Figure 61 may have been a skinning knife, a digging tool, or, if helved, an ax or adz. The gouge-like tool in Figure 62 may have served just as many purposes. Because these stone implements, especially the gouge, seldom show much evidence of wear, the theory has been advanced that when these tools were used on wood, the material was first charred by hot stones, and the tools used only to scrape out the charcoal. Anyway, we know that the Stone Age man made stone tools that resemble and could be used as chisels and gouges.

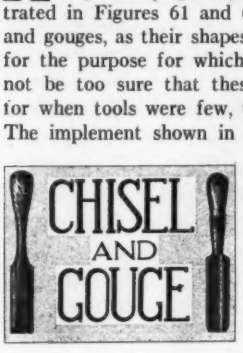


Fig. 61. Prehistoric stone chisel from the Polished Stone Age. Fig. 62. Stone gouge. Fig. 63. Primitive metal chisels. Fig. 64. Bronze tang and socket chisels found at Bologna, Italy, in a hoard of old implements dating from 900 B.C. Fig. 65. Iron chisels from Pompeii, 900 B.C.

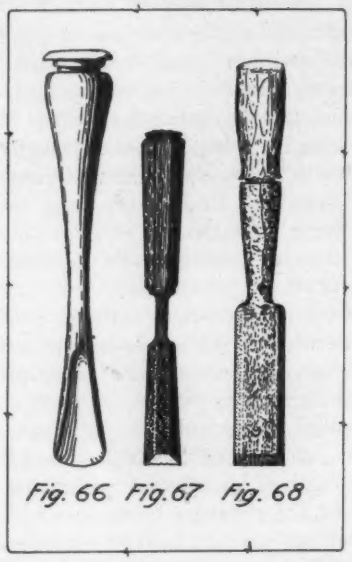


Fig. 66. Gouge from 800 B.C. Fig. 67. Hand-forged Dutch chisel made previous to 1596. Fig. 68. Hand-forged firmer chisel made in the early days of Ohio and now in the Museum of Western Reserve University, Cleveland

Probably the first metal chisels were simply bars of that material flattened and sharpened at the end like our modern cold chisel. Figure 63 shows ancient iron chisels of this type, but in all probability similar ones were beaten from copper, ages before iron was forged.

We have carvings of ancient Egyptian workmen shaping coffins by means of chisels. Indeed the chisel seems to have been quite an important tool with these ancient artisans. They invented the wooden mallet to go with the chisel, but never learned to tang or socket the chisel for a handle.

Most people would venture the opinion that the tang is an older means of fastening a chisel to its handle than the socket. Perhaps it is, but the oldest known chisels of both types were found together in a hoard of old bronze tools at Bologna, Italy. Their collector apparently got them together for remelting almost a thousand years before Christ. Figure 64 shows some chisels found in this hoard. The tang of the chisel marked A looks as if it had slipped out of the handle of a modern paring chisel. Two of these three chisels have single bevels. No chisels older than these have been found having but a single bevel. Study of these beautifully formed old tools will convince one that nearly three thousand years ago, men knew about as much about the form of chisels as anyone does today. What changes have been made since have been made as adjustments to the metal that supplanted bronze. The iron chisels of Figure 65 show some of the influence of the change of material. These two chisels are from Pompeii.

The gouge seemed to be quite a common tool in the Stone

Age, but for some unexplained reason, was less used when tools were made of metal. Only a very few ancient metal gouges have been found, and most of them in northern Europe. Figure 66, is of one of these primitive tools, but it must not be considered very typical of form, for those we have found vary greatly in their shape.

From the time iron supplanted bronze, to the beginning of the Factory Age in the last century, the making of chisels and gouges has been the work of individual blacksmiths. It is interesting to see how modern these old hand-forged tools appear. The Dutch chisel of Figure 67 looks like a twentieth-century factory product, but it must have been hand forged, for it was made previous to 1596. The socket firmer chisel of Figure 68 is quite evidently a hand-forged tool, but it is surprisingly modern in form.

Few implements that man uses today have changed as little in the many thousands of years that man has used it as the humble chisel. Its evolutions have been mostly one of materials, as it has been made of stone, then copper, later bronze, then iron, and finally steel. In form it has changed very little.

Most readers will be interested in the meaning and origin of the word "firmer," which is so frequently used as a designation of a kind of chisel. It is a word without a very definite meaning to most people who use it. Perhaps a quotation from an old English book *Mechanik Exercises*, by a writer named Moxon and published in 1693, will straighten the matter out (the parenthetical words are the author's): "There are two kinds of chisels, former (firmer?) and paring. The former is so called because it is used first before the paring."

Farm-Shop Management

Carl G. Howard

State Supervisor for Agricultural Education, Cheyenne, Wyoming

The farm-shop instructor is confronted by many problems in carrying on his work. These are ably discussed in this article. A very good equipment and supply list is also given.

THERE are at least fifty points which could be listed under the heading of farm-shop management. In this list there would be many things which would vary somewhat in different localities and different states. Standard practice in the farm shop in one state may not be accepted as such in another. It seems evident, then, that in a discussion of shop management, only fundamental points should be considered.

Six of the many factors making for successful or unsuccessful farm-shop operation seem fundamental and important enough for discussion. These may be listed as follows:

1. The purchase of equipment and supplies.
2. The handling and distribution of supplies.
3. The care of equipment.
4. The accounting system in use.
5. The character of finished products.
6. The utilization of the shop by the community.

If good business practices are followed in the management principles underlying the six items listed, the shop can justify its existence and at the same time account for all monies spent and received.

It may be said without fear of contradiction that good tools and equipment should be provided for anyone who is to develop skill in any operation or set of operations. The purchase of shoddy equipment or tools in order to save a little in original cost is a poor economy measure, because of the greater length of life of the better class of tools. Replacement costs would more than balance the original saving in capital investment. In addition to the money consideration, greater skill may be developed by the boys in the farm-shop classes with good tools and equipment. On a recent visit to one of the farm-mechanics departments of the state, some cheap wood vises were inspected which had been in use for only five or six months. None of them were in usable condition, while the boys were losing time waiting their turn at the one good machinist's vise which the shop possessed. The same may be said of some of the supplies, although there is less variation in screws, nails, and bolts than in tools.

Teachers of vocational agriculture are urged to requisition all equipment, tools, and supplies for the farm shop in the spring of the year for delivery by August 15. There should appear on this requisition everything necessary to the efficient conduct of the shop for the coming year under normal conditions. Wherever possible the practice of asking for competitive bids is recommended, since this usually lowers the cost of most items. There is one precaution which seems essential in making out a requisition for material upon which competitive bidding will occur. Trade names, accurate descriptions, and catalog numbers taken from standard catalogs must be an integral part of the requisition. Little more time is required to add the proper description to articles requisitioned than to leave it off, while its addition results in positive assurance of getting the desired article.

Where all supplies are handled by the school, their purchase in quantity on competitive bids allows them to be furnished to the farm shop at such prices that an addition of 10 to 15 per cent may be made to care for loss, waste, and breakage and still sell them to students for slightly less than prevailing retail prices in the community. Whenever possible, it is a good policy to see that a local merchant gets the contract in the competitive bidding so that he may make some profit on the order.

The method of handling equipment and supplies is, in detail, as variable as are the individual shop teachers. In general, a toolroom is considered essential in all Wyoming farm shops. Usually several keys to the shop are distributed. The janitor and superintendent in most cases have duplicate keys to the shop and some of them may not feel the responsibility for returning borrowed tools, equipment, and supplies that they should. Several schools have been burglarized, entrance being effected through an unlocked window. The toolroom in which all tools are locked prevents all of this, since there is only one key which is left in the possession of the teacher of vocational agriculture.

Cupboards with good locks are essential in safeguarding small supplies. Nails, screws, bolts, buckles, rivets, etc., may disappear at an alarming rate if not issued from locked cupboards in small quantities. This loss may not be at all intentional, but if supplies are put in boys' pockets in the shop, there is no way in which excess issuance may be checked. Usually storage space which can be kept locked can be found for larger supplies, as lumber, iron, etc. Only a reasonably small quantity should be available in the open shop. This may appear very distrustful of human nature, but experience has proved it the only way to prevent loss of supplies and tools.

Usually tools are issued by a tool boy who serves for a week at a time. When not issuing tools he can fit handles, file saws, and do other jobs which may be taken care of in the

available time and space. Numbered tags are in some cases put on the hook from which tools are taken and replaced by the tools on their return. Each boy, of course, has several tags upon which his number is painted. Check lists are also used in small classes, the instructor checking the tools with the list at the close of the period.

In most cases supplies are issued by the instructor as needed.

School Farm Shop, Worland, Wyoming

Equipment care is the responsibility of everyone using it and everyone concerned should be made to understand this. In many cases, boys will ask for a sharp plane when they are issued a dull one instead of sharpening the iron themselves. The methods by which boys may be taught the care of equipment are many. Any good shop teacher uses several every day. It seems unnecessary to detail them, but seems imperative to repeat that all boys in farm shops should be taught to care for school tools and equipment as well as or better than they would if the ownership were vested in themselves as individuals.

All equipment and supplies have value and must be strictly accounted for. The most satisfactory accounting system for the shop has an account with each major division of items purchased and disposed of. In opening a set of farm-shop accounts, inventories are copied on the debit side of equipment, tools, lumber, metal, leather and harness, and miscellaneous. The totals from these several accounts are added and a credit entry made in the *cash* and *capital-investment* account. As materials are used in the shop, the proper accounts are credited and debit entries made in the proper additional accounts; viz., jobs and projects, farmer service, publicity, overhead, pupils, other departments, and cash. No further explanation seems necessary here, since all entries are made in a regular double-entry ledger. Posting may be done at intervals and a trial balance should be taken monthly. Then at any time an inventory is taken it should have the loss or addition to the capital-investment accounted for in detail. An annual financial report to the superintendent or school board completes the statement of the teacher as to use of equipment, supplies, and tools in the shop and proves whether the shop has justified the expense or not, depending on the teacher and the working conditions.

Data for use in posting the ledger is best secured where some sort of *material report form* is used. This should have space for the boy's name, the name of the job, the number, size, and kinds of materials, their price, and the time used in completing the job. Every boy is issued a card for each new job started. Notations of materials and time are made by the boy as the job progresses, from a list of prices posted by the teacher. Values are assigned to all materials used when the job is completed. This total, together with the time, is checked by the instructor when he inspects and grades the finished product. Criticisms are made, mistakes pointed out, a grade given, and collection made from the boy before the job leaves the shop. There is no delay nor any cold storage. Everything is done while the job is hot. A receipt is issued to the boy, and the material report marked paid. This concludes the actual transaction.

MATERIALS REPORT

Sheridan High School Farm Shop

Job or Project _____ Date Job Completed _____

Name of Student _____

LUMBER

Number of Pieces	Thickness X Width	Length in Feet	Board Feet	Kind and Grade of Lumber	Value
	X				$
	X				
	X				
	X				
	X				

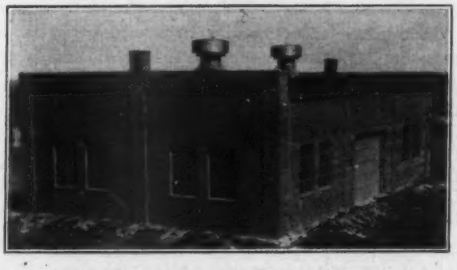
HARDWARE AND OTHER MATERIALS

Number	Size	Length	Kind and Description	Value
				$

Total Material _____

Student's Grade _____

Several schemes are in use for handling these cards until posted and for filing after posting. Any scheme which allows free access to them in order to check with the boy at any time as to how many skills he has developed during the year, or how nearly he is living up to the annual program of work which he set up at the beginning of the year provides the last step which is the open record for proving to anyone why one boy is doing better or poorer work than another. An aggregate of them all, shows the total work done by the class also.



Shop building, 40' x 60', Campbell County High School

The finished product must have an immediate use and be relinquished so that it may be used as soon as possible. Quality and workmanship should exceed the average farmer's standard to some extent. This matter will show great variation and is a matter largely determined by local conditions. In any case where a choice between "good enough" and "a little better than that" occurs, it seems wise that the finished product be a little better than necessary.

The farm shop should be so located and equipped that farmers will drop in to use equipment, observe the boys, and ask help. Sufficient reference material, a well-equipped shop, and a sympathetic teacher will insure that every farm shop is furnished and used by the community. This, with the points noted in the foregoing, makes of the shop an integral part of the community and eliminates any question as to its value.

In its final analysis then, farm-shop management differs in no particular from the management of any business. Any farm shop may be a successful enterprise if the instructor will see to it that good business practices are used in securing equipment, tools, and supplies, arranging for a businesslike handling and distribution of them, taking proper care of equipment, providing a strict accounting of supplies used and money returned, demanding a quality in finished product commensurate to its use, and proving to members of the community that they may make use of what they have paid for.

EQUIPMENT AND SUPPLIES FOR FARM-SHOP WORK

Farm Carpenter Tools

4 Claw hammers, 13-oz., bent claw
4 Claw hammers, 16-oz., straight claw
4 Crosscut handsaws, 24-in., 8-point
4 Crosscut handsaws, 22-in., 10-point
3 Hand ripsaws, 26-in., 6-point
12 Jack planes, 14-in.
1 Jointer plane, 18-in.
1 Block plane with 1⅝-in. cutter
1 Keyhole saw, 10-in., 10-point
1 Compass saw, 12-in., 8-point
1 Compass saw, 14-in., 8-point
1 Compass saw, 16-in., 8-point
2 Handsaw sets
1 Timber-saw set
1 Circular-saw set
1 Crosscut-saw tool
1 Set of 13 auger bits
2 Bits, ¼-in. (extra)
2 Bits, ⅜-in. (extra)
2 Bits, ½-in. (extra)
1 Expansive bit, ⅞ in. to 3 in.
1 Ratchet brace, 10-in. sweep
4 Ratchet braces, 8-in. sweep
3 Rose countersinks
1 Screw-driver bit, 5/16-in.
2 Screw-driver bits, ⅜-in.
1 Spiral-ratchet screw driver and set of drills
2 Screw drivers, 2-in.
2 Screw drivers, 4-in.
2 Screw drivers, 6-in.
2 Screw drivers, 8-in.
2 Screw drivers, 10-in.
6 Nail sets (assorted)
1 Set of 12 wood chisels, ⅛-in. to 1-in.
3 Wood chisels, ½-in. (extra)
3 Wood chisels, ¼-in. (extra)
3 Wood chisels, ¾-in. (extra)
12 Extra-slim-taper triangular files, 6-in.
24 Slim-taper triangular files, 6-in.
6 Regular taper triangular files, 8-in.
3 Round files 10-in.
12 Flat mill files, 10-in.
6 Flat bastard files, 10-in.
6 Half-round bastard files, 10-in.
3 Half-round wood rasps, 12-in.
2 Auger-bit files
12 Interchangeable metal file handles
2 Ratchet screw drivers, 1 4-in. blade, 1 6-in. blade
1 Marking gauge
1 Wood spirit level, 26-in.
1 Broad hatchet, 4½-in.
1 Hand ax, 2- or 3-lb.
1 Wrecking bar, 24-in..
2 Wooden mallets, 2¾-lb.
6 Steel wing dividers, 8-in.
6 T bevels, 10-in.
1 Drawknife, 10-in.
2 Combination carborundum oilstones, 2 by 8-in.
2 Steel bar clamps, 4-ft.
4 Steel bar clamps, 3-ft.
2 Each adjustable hand screws, 4, 6, 8, 10, and 12 in.
1 Homemade wooden bench vise with iron bench screws
2 Continuous-screw woodworker's vises
12 Rapid-acting woodworker's vises
2 Cabinet scrapers
1 Bracket saw with 2 doz. blades
1 Chalk line and box of blue carpenters' chalk
3 Putty knives
12 Combination miter and try-square, 12-in.
3 Steel squares (3 makes), 24-in.
12 2-ft., 4-fold rules
1 Wire file brush
6 Glass cutters
13 Paint brushes, 3 each, 1, 1½, 2, 2½, and 1 3½ in.
2 Varnish brushes, 1½-in.
6 Double workbenches
2 Single workbenches
14 Stearns-Roehl special bench stops
6 Saw-filing clamps
4 Sawhorses

Farm Metal-Working Tools

1 Blacksmith's solid-box vise, 4½-in. or 5-in. jaw
2 Machinist's metal vises, 4-in. jaw
2 Hacksaw frames with 2 doz. flexible blades
3 Riveting hammers, 12-oz.
2 Monkey wrenches, 8-in.
2 Monkey wrenches, 10-in.
1 Monkey wrench, 18-in.
3 Adjustable wrenches, 8-in.
3 Adjustable wrenches, 6-in.
3 Adjustable wrenches, 4-in.
1 Chain drill
1 Post drill with chuck to hold ½-in. round-shank drill
1 Drill chuck, ½-in. shank with square socket to take bit-stock drills
1 Drill chuck, 3-jaw, ½-in. shank, to hold small drills
3 Hand drills
3 Sets of nine twist drills, 1/16 to 3/16 by 64ths
3 Sets bit-stock drills, 1/16 to 3/16 by 32nds
1 Set of ½-in. round-shank blacksmith's drills, ⅛, 5/32, 3/16, 7/32, ¼, 9/32, 5/16, ⅜, 7/16, ½, 9/16, ⅝, ¾, ⅞, and 1-in.
3 Each bit-stock drills, 5/16 and ¼ in.
2 Each bit-stock drills, 7/32, 11/32, and ⅜ in.
1 Each bit-stock drills, 13/32, 7/16, ½, 9/16, ⅝, and ¾ in.
3 Carpenter's pincers, 6-in.
1 End-cutting nippers, 6-in.
3 Slip-joint pliers, 6-in.
1 Long-nose side-cutting pliers
3 Cold chisels, ½-in.
2 Cold chisels, ⅝-in.
1 Cold chisel, ¾-in.
3 Hand punches, ¼-in.
2 Hand punches, ⅜-in.
1 Hand punch, ½-in.
2 Sets of 5 pin punches
4 Center punches
2 Rivet sets
1 Whetstone
1 Screw plate (stock and dies) ¼ — 20; 5/16 — 18; ⅜ — 16; 7/16 — 14; ½ — 13; ⅝ — 11; ¾ — 10.
1 Grindstone
1 Motor-driven power grinder, ¼-h.p. motor, V belt, 1 by 6-in. grinding wheel, 1 beveled sickle-grinding wheel, ⅜-in. saw gummer, and 1 wire wheel brush
1 Set of blacksmith's taper taps
1 Homemade farm anvil
1 Blacksmith's anvil, 100-lb., ⅞-in. hardie hole
1 Straight hardie, ⅞-in. shank
1 Hot cutter with handle
1 Cold cutter with handle
2 Machinist's hammers, 1-lb.
3 Machinist's hammers, 2-lb.
2 Blacksmith's hand hammers, 2-lb.
2 Blacksmith's hand hammers, 3½-lb.
1 Geared forge with hearth 23 by 30 in.
1 Blacksmith's straight-lipped tongs, ¼-in.
1 Blacksmith's straight-lipped tongs, ⅜-in.
1 Blacksmith's fluted tongs, ⅜-in.
1 Blacksmith's bolt tongs, ⅜-in.
1 Farriers' tongs
1 Blacksmith's cross-peen sledge with handle, 8-lb.
1 Set hammer with handle

Soldering

2 Alcohol torches
6 1-lb. Spools wire solder (acid core)
2 1-lb. Spools wire solder (rosin core)
2 Tin snips
1 Blowtorch, 1-qt. capacity
1 Box soldering paste

Harness Repairing

1 Spring punch, 4-tube
1 Round knife
2 Trimming knives
6 Awl hafts and 12 assorted blades
2 Finished wheels
1 Edger
1 Riveting machine
10 Balls of No. 10 white linen thread
12 Balls of harness-maker's wax
4 Papers of sewing needles, assorted
3 Boxes assorted tubular rivets
2 Boxes assorted copper rivets
3 Pieces of beeswax
1 Stitching horse
3 Vise-stitching clamps
1 Piece harness leather, ½ hide
5 Gal. can harness oil
Harness repair parts, such as cockeyes, repair clips, hame loops, breeching dees, concord clips, etc., as determined by the kinds of harness used in the community

Concrete Work

1 Brick trowel
1 Plastering trowel
1 Pointing trowel, 5-in.
2 Shovels
1 Hoe
1 Wheelbarrow
1 Mixing box (homemade)
1 Tamper (homemade)
1 Cement groover and edger

Plumbing

1 Pipe vise
1 Die stock and set of dies, ⅛ to 1 in.
2 Pipe wrenches, 14-in.
1 Hack saw with 1 doz. flexible blades for cutting pipe

Leveling

1 Farm leveling instrument with tripod, rod and target
1 Steel tape, 50-ft.
1 Plumb bob

Tractor, Gas Engine, and Automobile Mechanics

1 Set of ratchet socket wrenches
1 Set of 10 engineers' double-end wrenches
1 Clipper belt lacer and belt hooks
1 Box flexible-steel belt lacing
1 Bundle of cut lacing leather, ¼ in.
1 Tube-repair kit
1 Tire gauge
1 Automobile jack
1 Tire pump
1 Hydrometer for battery testing
1 Box valve-grinding compound
1 Valve lifter
1 Valve grinder
1 Thickness gauge
1 Set of three bearing scrapers
1 Wheel puller
2 Spark-plug wrenches, ½ and ⅞ in.
1 Tappet-wrench set
1 Trouble lamp
6 Magneto files

1 Set magneto wrenches
3 Squirt oil cans
1 Oil measure with funnel top
3 Tin funnels, various sizes
4 Boxes each brass split rivets, 5/16, 3/8, 1/2, and 5/8 in.
1 Speed indicator
1 Wire wheel brush to fit grinder shaft
2 Wire hand brushes

Drawing Equipment

12 School drawing outfits, each consisting of board 17 by 22 in., wooden T square, and 2 triangles, 1/8 in. 30 to 60 deg., and 1/8 in. 45 deg.
12 Triangular boxwood scales, 3/32, 1/8, 3/16, 1/4, 1/2, 3/8, 3/4, 1, 1 1/2 and 3 in. scales
1 Set of drawing instruments (not over $5 a set)
1 Brass protractor
1 Box thumb tacks

Supplies

10 lb. 10d common nails
10 lb. 8d common nails
10 lb. 6d common nails
10 lb. 3d fine common nails
10 lb. 10d box nails
10 lb. 8d box nails
10 lb. 6d box nails
10 lb. 10d finishing nails
10 lb. 8d finishing nails
10 lb. 6d finishing nails
10 lb. 4d finishing nails
1 lb. 1-in. lining nails
1 lb. 1 1/4-in. No. 18 brads
1 lb. 1-in. No. 18 brads
1 lb. 7/8-in. No. 18 brads
1 lb. 3/4-in. brads
1 lb. 5/8-in. brads
2 Packages No. 2 cut tacks
2 Packages double-pointed tacks
1 Package assorted tinners' rivets
200 Assorted machine bolts
200 Assorted carriage bolts
1 Package assorted stove bolts
1 Package washers, each 3/16, 1/4, 5/16, and 3/8-in.
5 lb. assorted threaded nuts
2 Packages assorted lock washers
2 Packages assorted cotter keys
5 lb. assorted wagon-box rivets
5 lb. assorted oval-head soft-iron rivets
4 lb. assorted copper rivets and burrs
5 lb. cup grease
2 lb. chassis lubricant
5 gal. medium cylinder oil
5 gal. steam-cylinder oil for transmissions and differentials
5 gal. gasoline.
5 gal. harness oil
5 gal. turpentine
1 gal. boiled linseed oil
1 gal. raw linseed oil
1 gal. threading oil
5 lb. commercial putty
1 gal. denatured alcohol
3 lb. lump pumice stone
24 sheets sandpaper, each Nos. 0, 1, 1 1/2
12 sheets emery paper
12 sheets emery cloth
1 Package glazier's points
2 Boxes screw hooks and eyes, assorted
1 lb. right-angle screw hooks, assorted
1 Gross each flat-head bright iron screws: 3/4-in. No. 6; 3/4-in. No. 8; 7/8-in. No. 6; 7/8-in. No. 8; 1-in. No. 6; 1-in. No. 8; 1-in. No. 10; 1 1/4-in. No. 8; 1 1/4-in. No. 9; 1 1/4-in. No. 10; 1 1/2-in. No. 8; 1 1/2-in. No. 9; 1 1/2-in. No. 10; 2-in. No. 12
1 Gross each round-head blued wood screws: 3/4-in. No. 6; 1-in. No. 6; 1-in. No. 8; 1 1/4-in. No. 8; 1 1/4-in. No. 10; 1 1/2-in. No. 10; 1 3/4-in. No. 10; 2-in. No. 12
1/2 Ton blacksmith's coal
Round iron: 4 bars 5/16-in.; 3 bars 3/8-in.; 2 bars 7/16-in.; 2 bars 1/2-in.; 1 bar 5/8-in.
Flat iron: 3 bars 1/8 by 3/4 in.; 2 bars 1/8 by 1 in.; 3 bars 3/16 by 1 in.; 3 bars 1/4 by 1 in.; 2 bars 3/8 by 1 1/2 in.
Lumber purchased locally as needed.

Problems and Projects

A FIELD INSTRUMENT FOR THE JUNIOR AND SENIOR HIGH SCHOOL

Rudyard K. Bent and Lucien B. Kinney, University of Minnesota High School, Minneapolis

The topic of why and how we measure inaccessible distances plays an important part in the teaching of mathematics throughout the six years of the junior and senior high school. Ordinarily introduced in the seventh grade with scale drawing, a more refined and accurate method may be taught each year, until the pupil has learned how to make use of formulas and functions.

The problem of measuring inaccessible distances is in itself attractive and fascinating to the pupil. If he can make the measurements himself, it becomes doubly interesting. At the same time, the concepts of geometry and trigonometry are more definitely and permanently acquired if he has the experiences of planning the solution of a real problem and taking the necessary measurements.

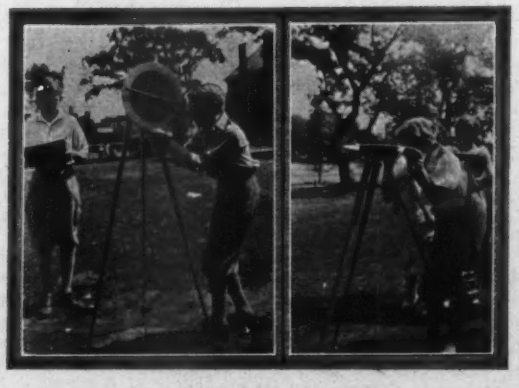
For field work of this sort, some kind of transit is necessary for measuring the angles. Many schools are equipped with a surveyor's transit for this purpose. This instrument however, has certain important disadvantages. The refined adjustments which it requires, make it difficult for the beginner to handle, and at the same time, this complexity tends to obscure the fact that essentially it is merely an instrument for measuring angles.

The cost of the surveyor's transit is prohibitive for many schools, and in those that have one the teacher is not usually willing to let a group of pupils use without such close supervision as to destroy all initiative.

For these reasons, while we have a surveyor's transit as part of our equipment, the mathematics department at the University of Minnesota High School has undertaken to devise a transit that will fulfill the following requirements:

1. It must be inexpensive and easy to make.
2. It must be light in weight and yet, rugged enough so that the pupils can handle it without being too closely supervised.
3. It must be simple and very obviously designed for measuring angles.
4. It must be designed so that by a simple adjustment it can be used to measure either horizontal or vertical angles.
5. It must make it possible for a pupil to measure angles with reasonably small error.

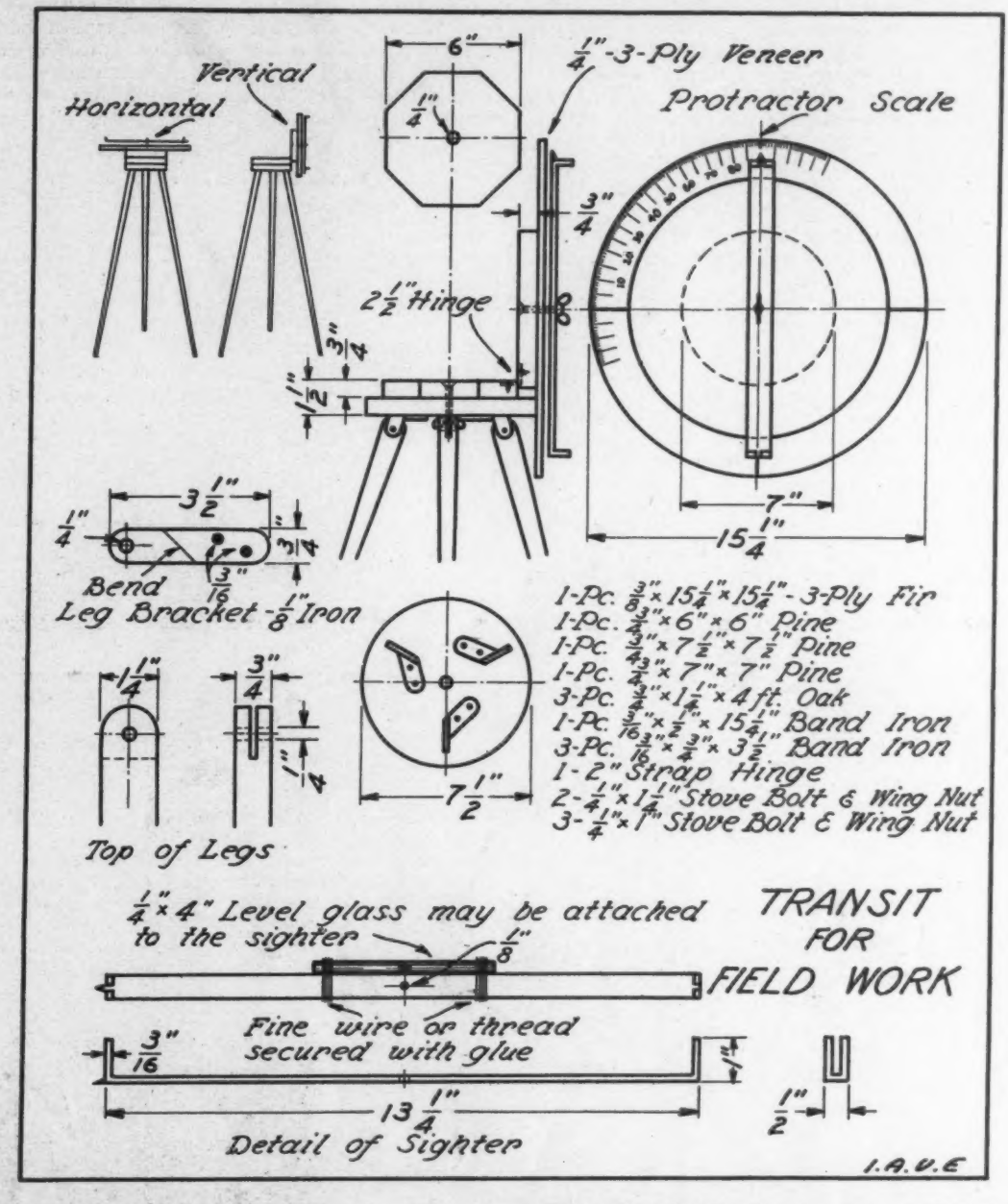
The transit illustrated herewith is the one that was finally accepted as satisfactory. Its cost, when made in the school shop, is about 65 cents. It is light enough so that the 7th-



The field instrument in use

grade pupils can set it up without difficulty, and still is apparently not easily broken. The simple adjustments by which the head may be rotated or tilted are apparent from the drawing.

When measurements of angles made by about 200 pupils from the seventh to twelfth grades were checked by measurements with a surveyor's transit, the average error was 30 ft. This was the first attempt for the pupils, and the error could doubtless be considerably reduced with practice.


Vertical
Horizontal
6"
1/4"-3-Ply Veneer
Protractor Scale
2 1/2" Hinge
3/4"
7"
15 1/4"
Bend
Leg Bracket - 1/8" Iron
Top of Legs
7 1/2"
1-Pc. 3/8" x 15 1/4" x 15 1/4" - 3-Ply Fir
1-Pc. 3/4" x 6" x 6" Pine
1-Pc. 3/4" x 7 1/2" x 7 1/2" Pine
1-Pc. 3/4" x 7" x 7" Pine
3-Pc. 3/4" x 1 1/2" x 4 ft. Oak
1-Pc. 3/16" x 1/2" x 15 1/4" Band Iron
3-Pc. 1/8" x 3/4" x 3 1/2" Band Iron
1-2" Strap Hinge
2-1/4" x 1 1/4" Stove Bolt & Wing Nut
3-1/4" x 1" Stove Bolt & Wing Nut
1/4" x 4" Level glass may be attached to the sighter
1/8"
Fine wire or thread secured with glue
3/16"
13 1/4"
1/2"
Detail of Sighter
TRANSIT FOR FIELD WORK
I.A.V.E

Instructions for Making the Transit

The top of the transit is made of 3-ply veneer to which is glued the blueprinted protractor scale. A printed scale, on cardboard may be purchased from dealers in drawing supplies. The protractor also may be laid out in the drawing department, and traced so blueprinted scales may be made at slight cost.

The circular top is glued to a 7-in. circular piece of white pine. This latter piece is hinged to the octagonal piece of the same material. These three pieces make up the head of the transit.

The head of the transit is fastened to the tripod by means of a bolt passing through the center of the octagonal piece. This bolt is tightened by means of a wing nut in order that it may be adjusted with the hand, so as to permit the leveling table to be tilted in a vertical position for measuring angles of elevation, or rotated or held stationary in a horizontal position for measuring angles of deviation. In the center of the table, an iron sighter is attached. This consists of an iron strap bent at right angles at either end at a distance of about 1 in. Slots are cut in the ends with a hack saw. The sighter is attached with a bolt and wing nut in order that it may be rotated and tightened with the hand. If desired, a small pointer can be fastened to one end of the sighter to facili-

tate reading. The drawing shows the details and also the completed instrument.

In order further to improve this instrument, a level glass filled with alcohol, may be attached to the sighter with fine wire or thread, glued into place, as shown in the illustration. These level glasses may be obtained at almost any hardware store.

HUTCH TABLE

D. A. Price, Chicago Heights, Illinois

(See Supplement No. 308)

The design of the hutch table described herein was adapted from one made in the earlier years of the eighteenth century. Its reproduction will appeal especially to the student craftsman who does not have much time at his disposal or who does not wish to spend much for material. The table may be made of maple, but if lumber costs must be kept as low as possible, pine may be substituted. In either case, however, it is well to use maple for the feet, stretchers, and cleats.

1. Glue up the top using dowels and preferably casein glue.
2. Dress down both sides and sand to a smooth, even surface.
3. Round and smooth the edges of the table with spokeshave or rough file and sandpaper.
4. The uprights should be accurately squared up and finished. The two may then be bradded together through the waste portions of the wood at the portions later housed in the mortises. They can then be cut out on the jig saw or on the band saw, or if necessary, by hand with a fret saw.
5. Cut the mortises in the feet before they are sawed to the outline shown. After the feet are finished, glue them securely to the uprights. The uprights and the sides and bottom of the hutch may then be assembled with glue. The screws with which the sides of the hutch are fastened are countersunk and concealed with dowel plugs glued in place as shown in the supplement. Putting glue into the holes only will secure the dummy dowels sufficiently and obviate the glue stains resulting when the glue is applied to both dowel and hole. This method of gluing is to be used only in the case of the concealed plugs. Pins securing mortises should be thoroughly coated with glue before driving them into place.
6. The cleats of the hutch table should be screwed to the top. The top is then put in position on the base after which the ½-in. pivot holes may be bored using the holes in the cleats as guides. Round off the rear corners on each of the uprights to allow the top to be lifted without binding.
7. Screw on the catch piece, No. 9, on the underside of the top and mark the location of the slot in the front side of the hutch. Cut out this slot carefully with a chisel so that the top will be held snugly when the catch is turned home. The top of the hutch table should then be removed from the base for finishing.

Method of Finishing

1. Give the wood a sponge bath with clear water to raise the grain. This also serves to raise to the surface accidental depressions caused by handling. Allow two hours or more for drying. Then sand thoroughly all over with clean-cutting No. 2/0 sandpaper. For the flat surfaces, use the sandpaper wrapped around a block.
2. Apply early American or old pine or antique maple acid or water stain. If it is desired to match the finish to other furniture, any necessary darkening of the stain may be done by mixing it with a similar stain of darker tone. Allow stain to dry six or seven hours, then sand and give a seal-coat. This may consist of thin white shellac; that is, the commercial 4-lb. cut to which an equal amount of alcohol has been added. Or a thin lacquerlike "color developer" that can be purchased ready for use can be used. This will give a thin transparent coating over the stain and brings out the beauty of the grain remarkably. If a thin type of finish is desired, apply a second seal-coat after sanding the first lightly and apply two coats of wax, well rubbed. A more durable finish is obtained by applying one or two coats of rubbing varnish, after the first seal-coat, and rubbing with pumice and oil.

MAGAZINE HOLDER

H. L. Weatherby, Lanier High School, Montgomery, Alabama

(See Supplement No. 309)

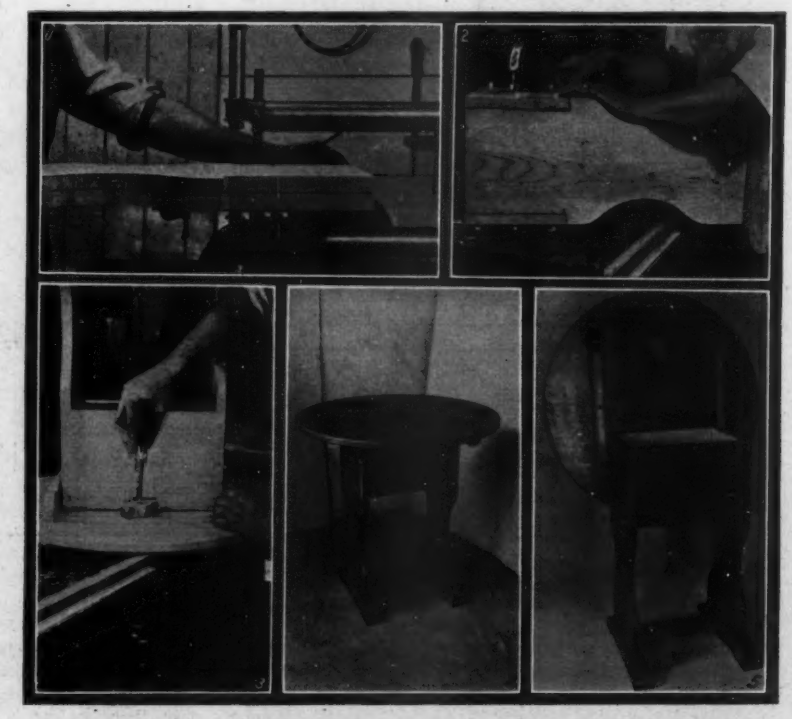
The construction of a magazine rack along slightly different lines, and finishing by somewhat different methods, is illustrated in the magazine holder given herewith.

Plywood will be found to be the most easily manipulated material available for this sort of construction. Any soft wood will do, however, provided it is well seasoned and does not split too easily.

The material list follows:

2 pc.	⅜ x 7¾ x 15	Sides
1 pc.	⅜ x 11¼ x 15	Back
1 pc.	⅜ x 11¼ x 5¾	Front
1 pc.	⅜ x 11¼ x 9	Partition
1 pc.	⅜ x 11¼ x 6	Bottom

If cardboard or paper patterns are used in sawing the outline, save them and lay out on them the design for the stencil. After the stencils have been cut, and the magazine



1. The uprights are bradded together and sawed to the outline at one time. 2. Concealing the screws with plugs glued in place. 3. Fastening catch to the table top. 4. The completed hutch table. 5. The hutch table with top raised

holder has been given one or more coats of some solid background color, the stenciled designs may be sprayed on as indicated, using a lacquer or quick-drying enamel, or they may be brushed on. Spraying, either with hand or power machine, however, will prove to be much more satisfactory.

At A is shown the application of the background color. Flow the lacquer on with a soft brush. Do not try to brush it out. At B is shown how the stencils are placed against the sides and front for spraying on the designs. The effect of the spray is beginning to show in the darkening around the stencil opening. The stencil is held in place with a block and string as shown. At C is shown the finished magazine holder.

RULES GOVERNING POWER-BOAT RACES AND COMPETITIONS

J. S. Turnbull, James Monroe Junior High School, Seattle, Washington

Boats, to be eligible, must have been made in the industrial-arts shops of the Seattle schools during the school year in which the race is held.

The committee reserves the right to disqualify any boat having a power plant considered dangerous. Otherwise, there will be no restrictions as to size of boat, or size or number of power plants.

Entries must be made through the industrial-arts teacher.

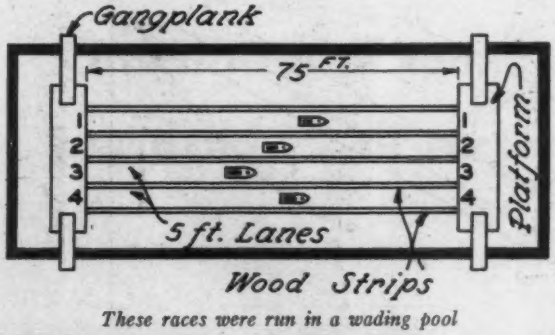
A silver trophy cup, with the name of the winner engraved thereon, will be awarded to the boy receiving the greatest number of points. Those placing second and third will be awarded ribbons.

Each boat enters into four distinct types of competition.

The Four Distinct Types of Competition

1. Boats will be judged for craftsmanship.
First-place winner receives 5 points.
Second-place winner receives 3 points.
Third-place winner receives 1 point.

2. Boats will be judged for speed over a 75-ft. course, divided into lanes 5 ft. in width by strips of wood in the water. The strips of wood force the boats to run in their respective lanes and prevents the waves from the leading boats affecting the course of the remaining boats. The fastest boat may not win this race unless the rudder is carefully set to steer the boat along the center of the lane. Should

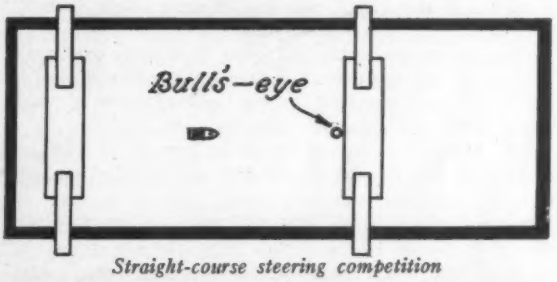


These races were run in a wading pool

the leading boat touch the strip of wood a time or two, then a slower boat, more skillfully directed, may come in first. This gives every boat a possible chance of winning. The two leading boats in each heat will enter in the finals of this competition.

First place awarded 5 points.
Second place awarded 3 points.
Third place awarded 1 point.

3. Straight-Course Steering Competition. A flag is stationed at a distance of 50 ft., as a bull's-eye. The boy who can best direct his boat and strikes nearest the flag is the winner.

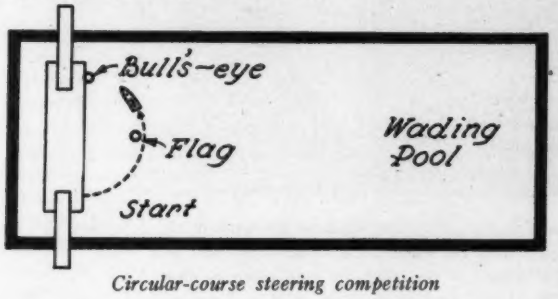


Straight-course steering competition

Power boats ready for the race

First place awarded 5 points.
Second place awarded 3 points.
Third place awarded 1 point.

4. Circular-Course Steering Competition. A flag is stationed 10 ft. from the platform. The boy starts 10 ft. to the right of center, and directs his boat around the flag to the bull's-eye, which is placed 10 ft. left of center. Any boat touching the flag is disqualified.



Circular-course steering competition

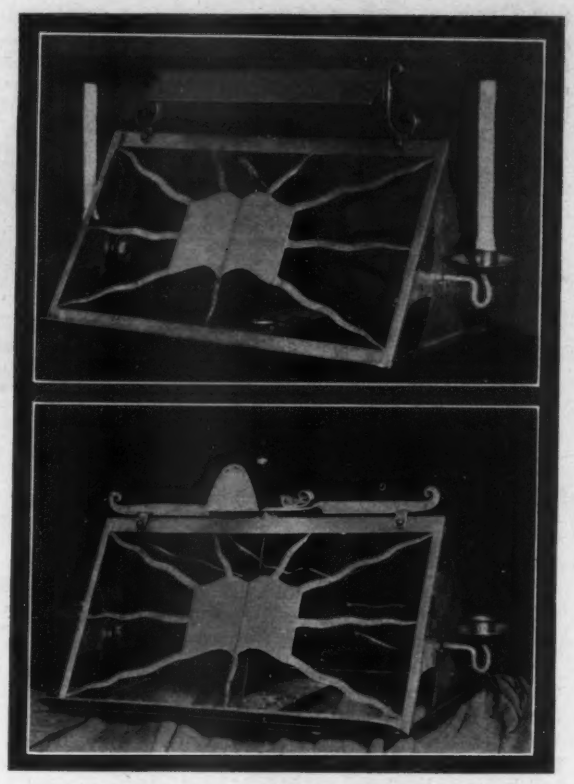
First place awarded 5 points.
Second place awarded 3 points.
Third place awarded 1 point.
Ties will be run off by additional competition.

A LECTERN

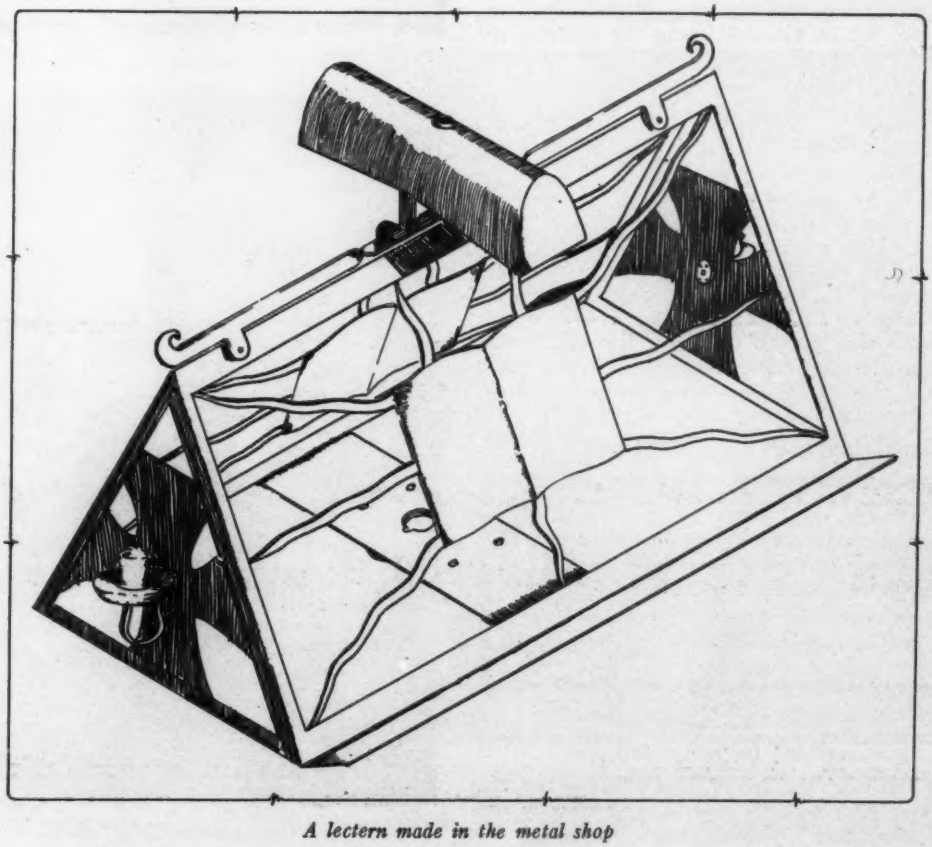
H. M. Andersen, J. Sterling Morton High School, Cicero, Illinois

The reading stand submitted herewith is easily constructed. The one shown was made for church use and embodies the use of religious symbols. Special lecterns may be appropriately designed for school and club use.

The one shown is constructed in the form of an equilateral triangle so that reading matter may be supported on either



The same lectern but differently illuminated



A lectern made in the metal shop

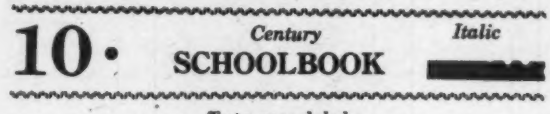
side. The triangular ends are made of ½ by ½ by ⅛-in. angle iron, connected at the top by two strips of ⅛ by 1-in. band iron, and at the bottom by 1 by 1 by ⅛-in. angle iron.

The crosses cut to fit into the ends, reinforced so as to support the candleholders, are made of sheet iron. The representation for the book in the center is made of two pieces of ¼ by 4-in. sheet steel, welded together. The material representing rays is made of ⅜ by ½-in. sheet steel forged to a taper shape and then welded. As a ledge of considerable width is necessary to support a large book, a strip ⅛ by 2½ in. was riveted over the angle iron on either side. The base of the support consists of a piece fastened across the width at the bottom. On this the stand may be elevated or revolved. Two types of lighting fixtures have been worked out as shown in the halfpones.

A USEFUL TYPE-CASE LABEL

Joel W. Lee, Owosso High School, Owosso, Michigan

Printshop students are prone to be careless in keeping type cases clean unless some device is used in the shop to make them pay particular attention to the kind of type they are using, and to teach them the distinguishing marks by which one font differs from another. These distinguishing marks are the type face or family, the size, and the number and position of nicks on the body of the type. Unless a student knows these distinguishing marks or takes time to be sure that he has the right font of type when distributing a form, he will frequently throw the type back into the wrong case.



Type-case label

To obviate this source of annoyance, the label shown herewith was designed. A different-colored label is used for each cabinet, thus guarding against the placing of cases in the wrong cabinet. The cut shows how such a label looks and how easy it is for students to locate the desired font or case of type in a minimum amount of time. The size of the type and the period used to designate the word point are set in 36-point Century Oldstyle Bold. A portion of the name of the type family is set in the respective type in the case being labeled, and the balance in 14-point Century Oldstyle Bold. The cut giving the exact size of the type, and the number and location of nicks, is made by taking a period or comma of the desired font of type, and soldering it broadside to the top of a linotype slug, and then filing the slug to type high. These characters may be picked from the hellbox or be taken from the font being labeled. The expense involved in making these labels is very small because scrap railroad board may be used.

A SIMPLE POTTER'S WHEEL

R. H. Jenkins, Humboldt State Teachers' College, Arcata, California

In the December number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the writer had an article on "Pottery and the Potter's Wheel." The article was written with the view of creating an interest in the fascinating work of the potter. The greater emphasis, therefore, was devoted to that phase of the work. This left little room for the discussion of the wheel and its methods of construction, so that a sketch of the wheel, not intended as a detailed drawing, was all that was given. It was offered merely as a suggestion. However, as some of the details were not entirely clear, it is thought best to furnish a more complete drawing of this simple machine.

There are two or three types of wheels which can be made for the throwing of pottery, but the crank type is probably the most satisfactory. Its construction is very simple and can be adapted to the varying needs and surroundings of the individual worker. The machine consists of a crankshaft some three feet long running vertically in a good substantial frame. The shaft may be made of any piece of steel that can be successfully and easily forged into a small crank. In the shop of the writer, one wheel has a shaft ⅝ inch in diameter, while another one has a diameter of ¾ inch. The sweep is about the same in both machines. The actual distance from the center of the shaft to the center of the crank is 3 inches. This is not a rigid measurement, but can be modified to suit the designer. The main thing is not to make the distance so great that the stroke is too long for the convenient reach of the operator's leg.

The lower bearing should be some type of thrust bearing,

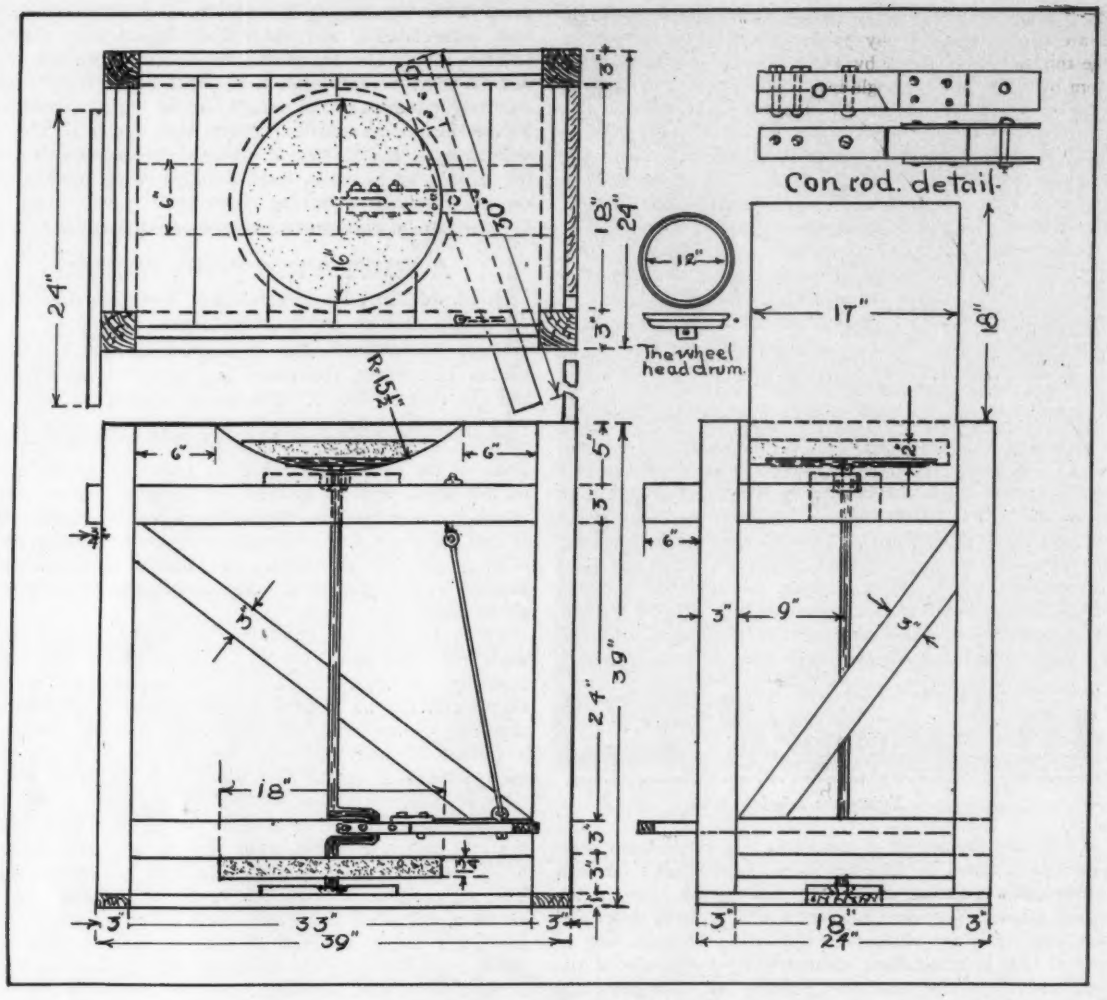
FOR YOUR BULLETIN BOARD

POSTER 59 APRIL, 1935

Orderliness of tools, persons, and material is practiced in all successful shops and factories

© Industrial Arts and Vocational Education

Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York



A simple potter's wheel

FOR YOUR BULLETIN BOARD

POSTER 60 **APRIL, 1935**

Successful craftsmen and workmen know how to, and do, follow directions

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

and the top of a ball or roller design. These can be purchased from any auto-wrecking house or auto-supply house.

The flywheel should be fairly large and heavy, and can be made from some discarded cast-iron wheel, or by casting a concrete wheel. The wheel head should be made of casting plaster and should be held in place on the end of the shaft by some type of removable drum, or disk.

The diameter of the wheel head may run from 12 to 16 inches, and that of the flywheel from 15 to 18 inches. The connecting rod may be made in various ways to suit the equipment of the worker. Hard wood works well, and is less noisy than iron or steel. Small stove bolts will do nicely to fasten the rod to the crankshaft. Two pieces of strap iron, fastened to the other end of the connecting rod with screws, form a pivoted joint to hold the connecting rod to the driving shaft. This joint was not very clear in the December sketch. The driving shaft may be placed either to the right or left of the crankshaft. In many cases it is on the left. The writer, however, prefers it on the right side as that gives an opportunity to kick with the right foot. One end of the driving shaft is fastened with another pivoted joint to the back of the wheel frame. The location of this point will vary and should be adjusted to suit the best running action of the wheel. This driving shaft should be made of hard wood, and should extend out in front of the wheel far enough to hold the foot easily. The end which is pivoted to the frame may be held in place with some more pieces of strap iron. Care should be taken to keep this driving shaft as near the floor as possible so as not to lift the foot too high for comfort.

The frame may be made of any kind of wood, and in almost any dimensions. There are only a few necessary requirements. The height should be such that the worker can get well over his work, and the wheel head should be as near the front and the operator as possible. There should be a trough to catch the mud and water, and the upper bearing should be protected from the mud.

The piece which extends out, in this case on the left side, is a rest on which to lean while working the wheel. The large board on the right is used to hold the turning stick while the turning is in progress.

Any practical type of joint may be used in the construction of the frame of the wheel, and should be designed to suit the ability of the worker.

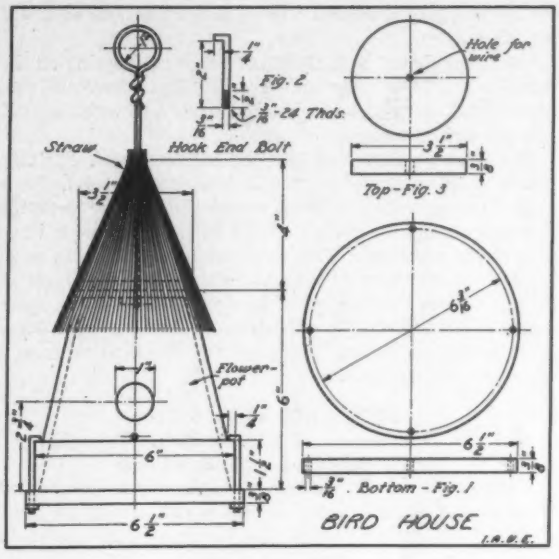
A BIRD HOUSE FOR THE GARDEN

James A. Hoskins, Calexico, California

Bird houses may be ornamental, but to attract birds they must be comfortable and suited to the needs of the birds. Aiding birds in their homemaking is not only interesting to the home owner, but he is well repaid by the destruction of pests and weeds upon which his feathered friends feed.

Different birds take different-sized houses and different-sized openings as shown by the accompanying table taken from the U. S. Department of Agriculture Farmer's Bulletin No. 1456.

	Floor cavity Inches	*Depth Inches*	*Entrance above floor Inches*	*Diameter of entrance Inches*	*Height above ground Feet*
Bluebird	5 x 5	8	6	1½	5–10
Robin	6 x 8	8	X	X	6–15
Chickadee	4 x 4	8–10	6–8	1⅛	6–15
Titmouse	4 x 4	8–10	6–8	1¼	6–15
Nuthatch	4 x 4	8–10	6–8	1¼	12–20
House wren	4 x 4	6–8	1–6	1	6–10
Bewick's wren	4 x 4	6–8	1–6	1⅛	6–10
Violet-green swallow	5 x 5	6	1–5	1½	10–15
Tree swallow	5 x 5	6	1–5	1½	10–15
Barn swallow	6 x 6	6	X	X	1–3
House finch	6 x 6	6	4	2	8–12



A wren house

Purple martin	6 x 6	6	1	2½	15–20
Song sparrow	6 x 6	6	4	2	8–12
Phoebe	6 x 6	6	X	X	8–12
Crested flycatcher	6 x 6	8–10	6–8	2	8–20
Flicker	7 x 7	16–18	14–16	2½	6–20
Golden-fronted woodpecker	6 x 6	12–15	9–12	2	12–20
Redheaded woodpecker	6 x 6	12–15	9–12	2	12–20
Downy woodpecker	4 x 4	8–10	6–8	1¼	6–20
Hairy woodpecker	6 x 6	12–15	9–12	1½	12–20
Screech owl	8 x 8	12–15	9–12	3	10–30
Saw-whet owl	6 x 6	10–12	8–10	2½	12–20
Barn owl	10 x 18	15–18	4	6	12–18
Sparrow hawk	8 x 8	12–15	9–12	3	10–30
Wood duck	10–18	10–15	3	6	4–20

The bird house shown in the accompanying drawings and sketch is made from a flowerpot. It has a thatched roof. It looks really ornamental hanging from a tree limb, or an arbor at the side of the garden. It is a comfortable bird house, affording an even temperature. It also may be easily cleaned out at the end of the season.

In making this bird house, it is necessary first to decide what kind of bird you wish to attract. Let us take the house wren. From the table we see that the floor space should be 4 by 4 in., and the opening should be 1 in. It will take a 6-in. flowerpot to make a house to fit these dimensions. First locate the opening, drill a small hole with an ordinary metal drill. To enlarge this hole to the desired size, take an old file and use the tank as a reamer until the hole is large enough to admit the other end of the file. Then keep on reaming until the hole is of the desired size. Next, cut a wood disk about 6½ in. in diameter for the bottom. See Figure 1. A piece of wood taken from a packing box may be used for this. The bottom is held on by four hooks and bolts, shown in Figure 2. These can be made from a piece of 3/16-in. wire threaded on one end and bent over at the other. The hook ends extend over the flange of the flowerpot, and the bolt goes through the holes in the bottom and are secured by nuts on the underside. Next, make a similar wood disk to fit the small end of the flowerpot.

About 20 in. of wire is needed for the hanging. On one end, make a 1-in. loop. This wire should be put through the small wood disk and then through the hole in the small end of the flowerpot. It can be held on the inside of the flower-

pot by wrapping it around a piece of stick or nail so it will not slip out.

The perch should be located just below the opening on the outside. A 3/16-in. hole can be drilled just above the rim, and a metal or wood perch can be fastened in with metal X or some similar cement.

The house is then ready for the thatched roof. For this, slough grass, straw, or any tough grass may be used. Tie it around the wire about 4 in. above the house. After arranging it evenly around the wire, it should be tied down with a fine wire at the wood disk. This wire may be secured with small staples and the wire may be covered with a thin layer of grass. The lower ends may be trimmed just above the opening. The base should be painted green, and the bird house is ready to hang in any desired and protected place from a tree limb or from an arbor.

PEWTER TEA SET

H. H. Henderson, La Salle-Peru Township High School, La Salle, Illinois

The pewter work in the accompanying illustrations shows some of the articles made by girls in one of our art-metal classes. This course is an elective for senior girls and meets one hour per day throughout the year. The work is given in the general metal shop with very little extra equipment other than that required for boys' general metal work. Project work in pewter is only one phase of the course. We also do work in tin, brass, copper, nickel-silver, and sterling. The common projects include rings, pendants, book ends, desk sets, pewter tea sets, some cold-iron bending, and repair of electrical devices common in the home.

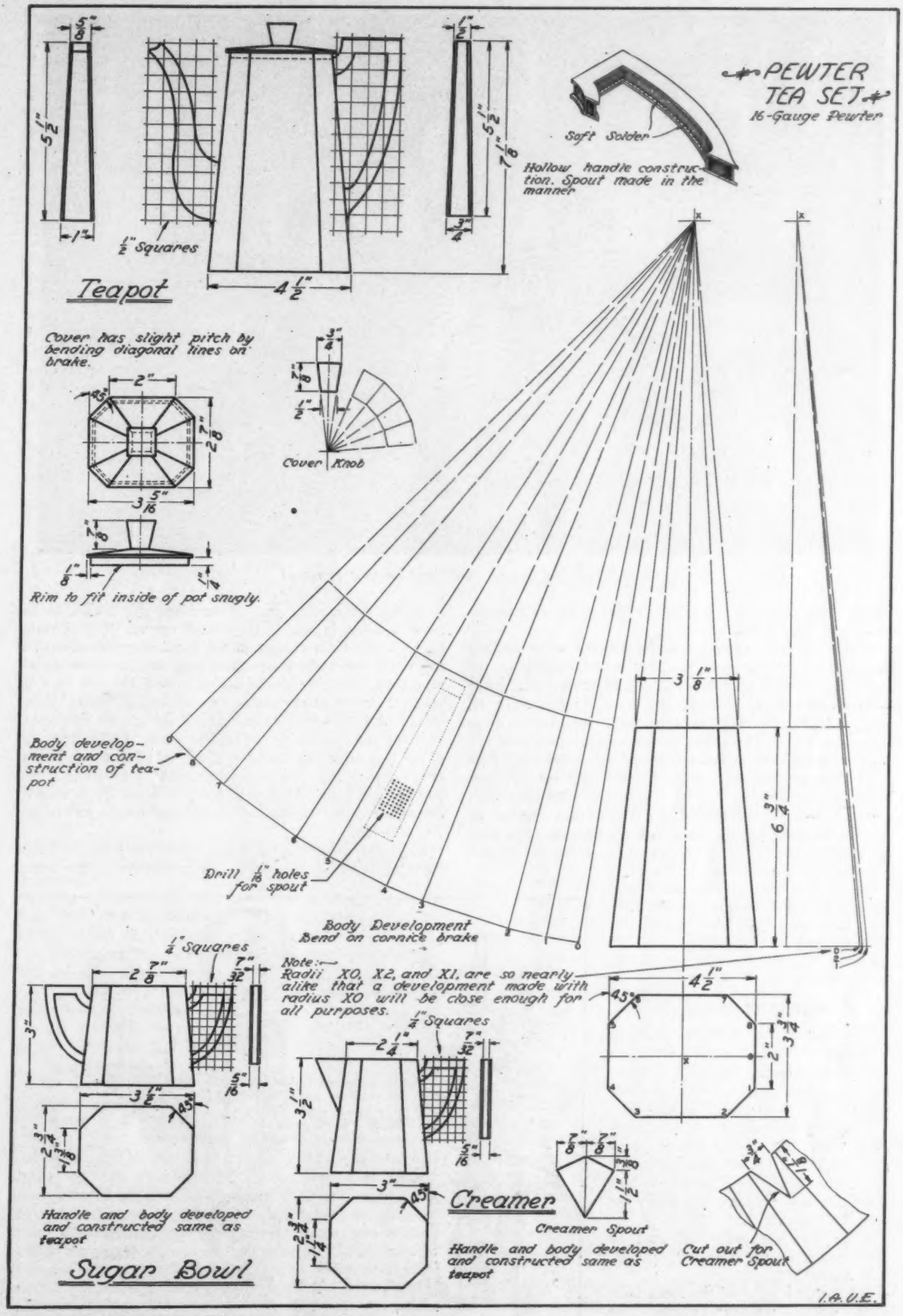
The octagon-shaped tea set was designed to get away from the purchase of special stakes which most round designs require, and also to utilize one of our present machines; namely, the cornice brake. It also was found that the octagon shape was more popular with the girls, and somewhat simpler to make.

In planning a tea set as a class project, it is well to standardize the size of various pieces and then to draw master patterns for the bodies of each article. This does not mean that all students should make exactly the same size and shape, but rather to have a standard to work from.

The sugar or creamer should be attempted first because they are the simpler. If the student is trying to work in pewter for the first time, it will be well to try a small project first so as to get some experience in the working of pewter,

Summer-School Opportunities for Teachers of Industrial Arts and Vocational Education

State	Name of School	Location	Person in Charge	Terms	Length of Terms in Weeks	Dates Opening	Dates Closing	Undergraduate: Arts Economics; Cabinetwork, Cabinet Work; Plumbing, Sheet Metal; Plain Bookbinding; Electricity, Elec. Wiring; Machine Shop, Bench, Forging, Foundry; Mechanical Drawing, Mech. Drawing; Welding, Soldering; Carving, Finishing; Chemistry; Concrete, Plastics and Decorative; Pottery, Ceramics and Enameling; Industrial Arts, Fine; Architecture, Elementary; Drafting, Blueprints, etc.; Printing and Publishing; Shop Planning, Management; Shop Mathematics; Industrial Arts, Administration and Supervision of Industrial Arts; Related Work, Materials; Safety and Hygiene; Survey and Courses, Construction; Arithmetic, History, Sociology; Materials, Methods and Research; Organization, Administration and Supervision of Industrial Arts; Principles and Problems of Industrial Arts and Part-Time and Evening Education; Graduate: Economics, Statistics
Ala.	Alabama Polytechnic Institute	Auburn	Zebulon Judd	2	6-5	June 3	Aug. 17	X X X


PEWTER TEA SET
16-Gauge Pewter
Soft Solder
Hollow handle construction. Spout made in the manner
Teapot
1/2" Squares
Cover has slight pitch by bending diagonal lines on brake.
Cover Knob
Rim to fit inside of pot snugly.
Body development and construction of teapot
Drill 1/16" holes for spout
Body Development
Bend on cornice brake
Note:- Radii XO, X2, and X1, are so nearly alike that a development made with radius XO will be close enough for all purposes.
Handle and body developed and constructed same as teapot
Sugar Bowl
Creamer
Creamer Spout
Handle and body developed and constructed same as teapot
Cut out for Creamer Spout
I.A.U.E.

A sample of pewter work done by girls (seniors)

and also to conquer the art of soft soldering before attempting a more complicated article.

In starting the creamer, first develop the body and cut to size. Then file the joint carefully before bending on the brake. The joint is held in place by iron binding wire while soldering. The mouth blowpipe can be used for soldering all joints. The flux is made of 1 oz. glycerine and 10 drops hydrochloric acid. The solder is soft solder. Sometimes bismuth solder is used in delicate places. After the body joint is soldered, proceed to true the bottom edge for soldering, which may be done by rubbing the bottom edge on a sheet of emery cloth which is placed on a true surface. The bottom is a flat piece cut a little larger than the body so as to allow for soldering and filing. Next proceed to make the handles or the spout as shown in the details.

One caution for the beginner working in pewter is to keep the project free from unnecessary scratches and marks while working on it. Scratches are easily put in but take much buffing and polishing to remove.

BIRD HOMES

W. L. Dorrance, Whittier Junior High School, Lorain, Ohio

Boys are naturally interested in birds, but often their interest, if not properly directed, is a detriment to bird life. This, simply because they do not understand birds. One of the best ways to give the boy a proper appreciation of our feathered neighbors, is to have him construct and properly place one or more bird houses.

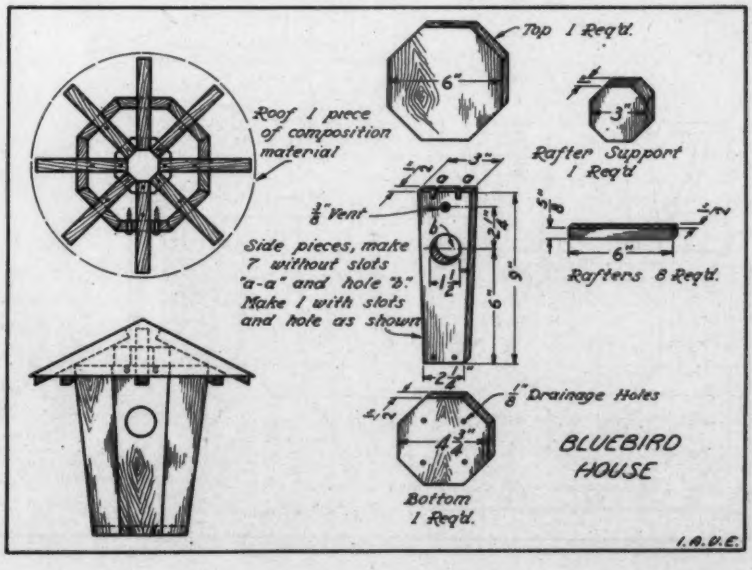
Birds that are easily attracted to these homes are the following:

The Robin

The natural home of the robin is in open woods, wooded swamps, and meadows. Year after year, these birds will return to the same locality in which they were reared. This explains why we find birds nesting in the heart of great cities. The robin will not build in a closed box, and so, if we would have them about we should fasten a shelf about 6 by 8 in. under the eaves of our homes or outbuildings. These shelves should be placed high enough above the ground to prevent anything from molesting the eggs or young. The robin is one of our best birds and should be protected at all times. During fruit season they are often persecuted for eating a few cherries which they have paid for a thousand times over by destroying countless numbers of harmful insects and larvae.

The Bluebird

Bluebirds are among the first to come north in the spring. They often arrive before the last snowstorm of the winter



has passed. Because of their early arrival, they often suffer from lack of food. The food of the bluebird consists mostly of insects.

Bluebirds build their nests in hollow trees and posts. They will come readily to houses placed for them upon posts and outbuildings. The birds will return year after year and rear their young in the same house.

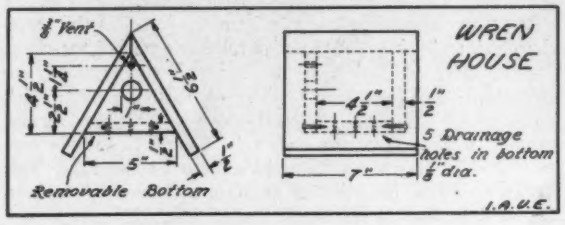
Because of its economic importance to man as an insect destroyer, it should be given our care and protection. The bird houses for bluebirds should be roomy, with the opening near the top.

Construction of a Bluebird House

After the top and bottom pieces have been cut out, they should be beveled so that the sides will fit closely. The front board is made so that it can be removed. The rafters are nailed into the top and the support. The roof is cut from a piece of composition material. This makes a small problem in development which the boy will enjoy working out.

The House Wren

Of the birds which build their nests near our homes, there is no other as vivacious as the house wren. From the time they arrive, until after the nesting season has passed, there is one continual round of activity. The wrens are unexcelled as insect destroyers. The houses for the wrens should be placed, if possible, in the shade. These may be fastened on posts or against the side of the house.



The Purple Martin

In many books on the life of the Indian, we learn that the martins lived near the tepees, making their nests in gourds which the Indians hung up for that purpose. They are, perhaps, the most easily attracted of all birds. The houses may be single or apartment style. These should be placed upon posts in such a way that they may be lowered for cleaning.

Things to Remember when Building Bird Houses

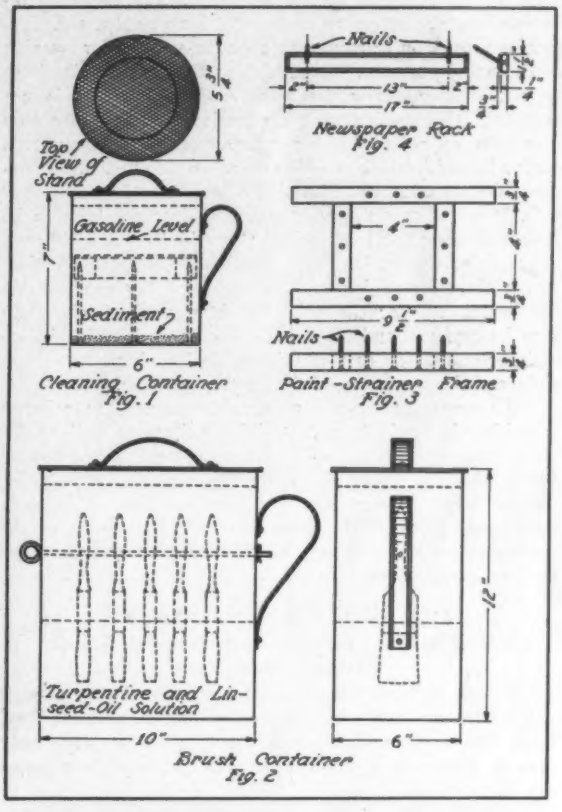
1. Always construct a bird house in such a way that it may be cleaned.
2. The openings into the wren houses should never be more than 1 in. in diameter. If they are larger than this, other birds are likely to molest the young.
3. Houses for the birds which build in a cavity should have the opening near the top.
4. Bird houses should be in place some time before the birds return in the spring.
5. Do not erect too many bird houses about the yard and garden. Birds, like people, resent being crowded.

BRUSH-CLEANING AND PAINTING EQUIPMENT

Joseph F. Barta, Milwaukee Vocational School, Milwaukee, Wisconsin

It is the lot of the shop teacher to be confronted frequently with shop problems of various kinds that call for some kind of solution so that the classwork may go on smoothly. Some of these problems are easily solved, while others challenge the ingenuity of the teacher, and perhaps months may pass before they are eventually taken care of. It is said that necessity is the mother of invention, and so, under the impetus of the constant demand to lower operating shop costs because of reduced budgets, new ways and means of doing the same jobs efficiently as well as economically, have had to be devised.

One of these problems is the matter of taking care of paint brushes in the school shop. Gasoline, because of its cheapness, has been used largely for cleaning them. It has been found, however, that brushes washed thoroughly in it, and then in soap and water, and hung up to dry, will become hard in spite of repeated cleaning and washing. Turpentine is a better cleaner than gasoline. Its cost becomes prohibitive, however, when it cannot be used after the cleaning process as a thinner, but has to be disposed of.



To solve this problem, the can shown in Figure 1 was devised. It is provided with a cover to prevent evaporation of the gasoline or turpentine used for cleaning the brushes. Inside the can is placed a stand made up of a wooden ring, on the top of which is nailed a piece of diamond-mesh metal lath. This ring is supported by five or six 16d common nails, as shown. The brush is worked vigorously over the metal lath submerged in the solvent to the level shown. This cuts the paint from between the bristles and allows it to fall through the ring to the bottom of the can. The brush should never be allowed to touch the sediment at the bottom of the can, as it is of a very sticky and greasy nature, and is very hard to remove from the bristles.

From time to time, the sediment that collects at the bottom of the can must be removed. This can be done very easily by removing the stand, pouring the gasoline into another container, and allowing the sediment to dry. It can then be easily removed with a putty knife, or a screw driver.

A small amount of gasoline must be added from time to time to the container to allow for that which is lost during the cleaning process, or by evaporation. However, the amount of gasoline used during the year with this method is very small.

In Figure 2 is shown a container with a handle and cover for holding the brushes suspended in a solution of half turpen-

tine and half linseed oil, after cleaning. A piece of ⅛-in. drill rod supported as shown, is run through a hole bored through the handles of the brushes. Brushes that are hung up to dry after cleaning, unless all of the paint has not been removed from between the bristles, soon become hard. Suspending the bristles in the solution described, leaves the brush serviceable even after several years use. When the brushes are taken from the can, the solution should be worked out on the sides of the can, and the bristles wiped dry with a cloth.

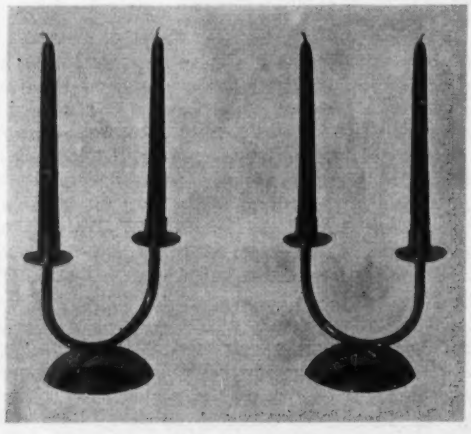
The matter of straining the paint is also a problem in some shops. The use of the regular paint strainer is advisable where a large amount of paint is to be strained. Turpentine must then be poured through the strainer for cleaning and thinning purposes. Where a small amount of paint is to be strained, especially flat paint, a large strainer is not practical. The leading paint companies, however, manufacture small cone-shaped paper and cheesecloth strainers at 50 cents a hundred, which are quite economical to use. The home-made frame, constructed as shown in Figure 3, works very well. It is set over the paint pail and does not have to be held until the paint has strained through. A piece of cheesecloth, 6 in. square, is placed on the projecting nail points driven through the frame. This holds the cloth in position for straining. After the paint has been strained, the cloth may be removed and discarded, after squeezing out the remaining paint. The cost of this piece of equipment is negligible, and this strainer is efficient and easy to use.

Old newspapers serve a very useful purpose as a bench covering while mixing and straining paints, as well as for many other jobs in the shop. To make them accessible and handy, the rack shown in Figure 4 was devised. The newspapers should be separated and hung on the two finishing nails driven through the piece of stock, the length of the protruding nails governing the number of sheets that can be hung at one time.

DOUBLE CANDLESTICKS

G. O. Wilber, Oswego State Normal School, Oswego, New York

The present trend toward a more diversified shop offering has led many instructors to experiment with metal spinning. The candlesticks described in this article, while they may be either hand wrought or spun, are especially suited



Double candlesticks

to the latter treatment. The spinning may be accomplished on a regular spinning lathe, on an engine lathe, or on a wood lathe. In case either of the last two are used, some type of auxiliary tool rest must be provided to support the spinning tools.

A suitable piece of hard, close-grained wood is mounted on the faceplate, and with ordinary wood-turning tools, shaped to the outline of the base. Birch, maple, or dogwood make the best chucks. The surface of the form should be carefully smoothed with sandpaper.

A disk of No. 20 gauge soft brass is cut and placed against the center of the chuck, as shown in Figure 2. This figure also shows how the metal is held in place by a small block of wood known as the follow block. This rests against the center of the disk and is held in place by the tailstock center. Before starting the lathe, a little powdered rosin should be placed on the end of the follow block and on the chuck where they come in contact with the metal. This will prevent the disk from flying out of the lathe while it is being trued. Start the lathe in slow speed and hold a flat stick against the rotating edge, at the same time slightly loosening the tailstock. (See Fig. 2.) *Do not stand in line with the disk while performing this operation.* When the work is running true and even, tighten the tailstock, and lubricate the surface of the metal with cup grease, soap, or tallow.

The tool rest is set slightly *below* the center of the work, and the pin which is to support the tool is placed just to the right of the disk. Adjust the lathe to run between 800 and 1200 r.p.m. (a much slower speed may be used successfully), and using a tool with which you can get close to the follow block, start forcing the metal over the chuck. (See Fig. 3.)

Great care should be taken to keep the metal in the shape of a cone, and not to let the edge roll back toward the right. To prevent this, and also to overcome the tendency to wrinkle at the edge, use a piece of flattened broomstick known as a backstick behind the work, with the regular spinning tool in front, as shown in Figure 4. In this way the metal is drawn out flat and smooth to the edge. This operation should be repeated as often as necessary to keep the work in the correct shape.

When the disk has been worked for a short time, it will become stiff and difficult to work. It must then be removed from the lathe, heated to a pink heat, and plunged into clear water. This will anneal the metal so that it may be worked again. When the disk is flat against the chuck, it should be smoothed with a flat tool known as a burnisher. The rough edge should now be trimmed off with a sharp-pointed tool, and the work polished with fine emery cloth and steel wool. The four wax cups are spun in exactly the same manner from disks of brass 2½ in. in diameter.

The upright part of the candlestick is made from ⅛-in. iron-pipe-size brass tubing. This should be thoroughly polished and then filled with lead. If the pipe is warmed, the lead will flow into it more readily. Next, turn or saw a wooden disk the size of the inside of the curve with a shallow groove around the outside to aid in holding the tubing while bending. A hole is drilled or sawed at the center of the disk large enough to allow the end of a C clamp to be inserted, as shown in Figure 5. The tubing is then clamped to the disk and bent into shape. Most of the bending can be done with the hands, but for the last stage a large hand clamp or a vise must be used. Now trim the uprights to exact height, and thoroughly polish and buff all parts.

The candleholders are made from 1-in. brass tubing, although they could easily be rolled from sheet brass and hard soldered. These are wired to the wax cups to hold them in place while soldering. The use of a small blowtorch aids in making a neat job of this soldering.

A 13/64-in. hole should be drilled at the center of each base, and also at the centers of the wax cups. Drill and tap the uprights for 3/16 by ¼-in. machine screws to hold the parts together while soldering. Sweat all joints together with soft solder.

The student has considerable choice in the matter of finish. The candlesticks may be polished and left in the natural brass, or they may be oxidized. If a more modern touch is desired, they may be nickel or chromium plated.

cut by hand with chisels and gouges, or if several candelabra are being made it would be more practical to cut them by running the bases diagonally over the circular saw, or cutting the cove with a shaper.

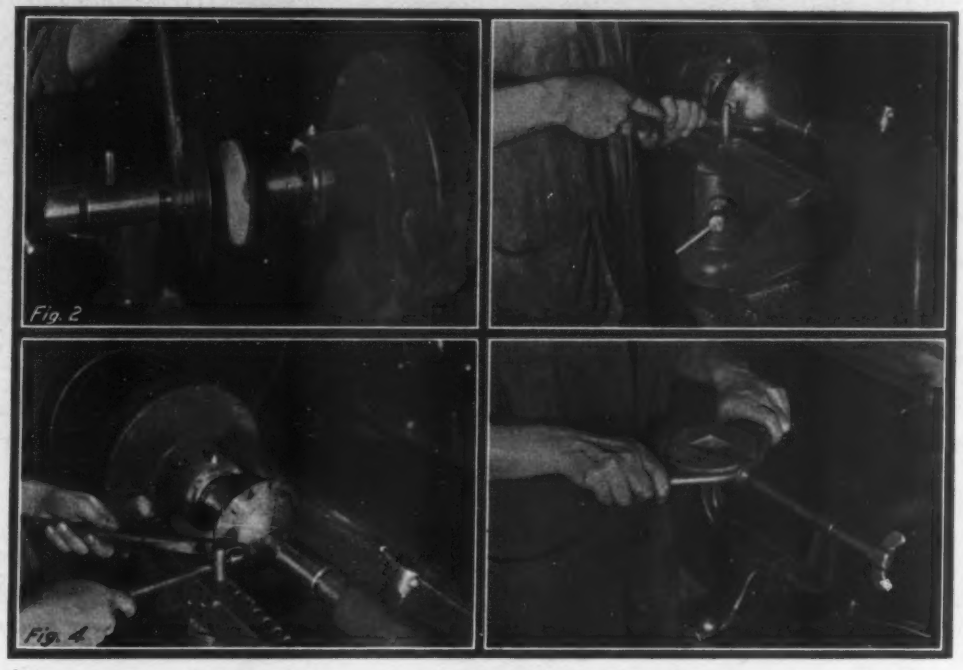
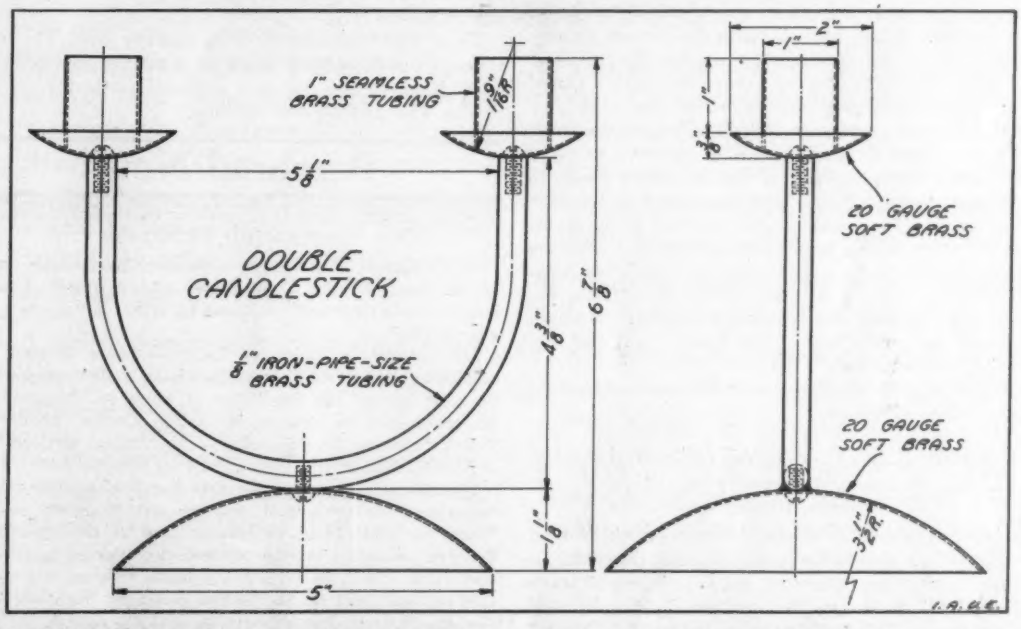


Fig. 1. The candlesticks. Fig. 2. Centering the disk. Fig. 3. The spinning. Fig. 4. Keeping the wrinkles out of the spinning disk. Fig. 5. Bending the tubing



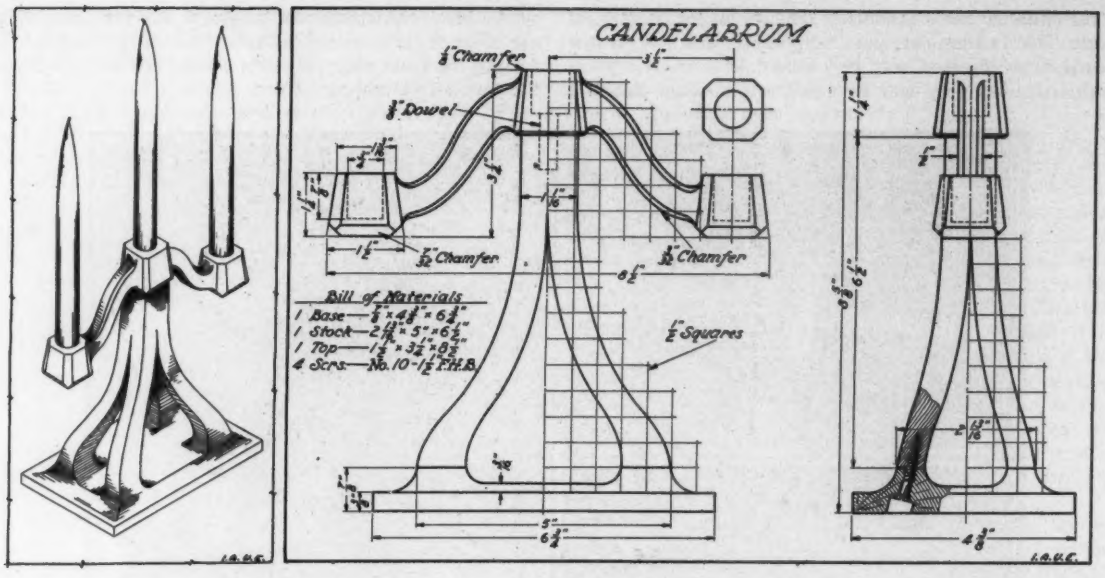
AN INTERESTING CANDELABRUM

H. H. Robinson, Senior High School, Augusta, Kansas

The candelabra illustrated and described herewith are practical and workable projects besides being useful and attractive. They also have the advantage of being depression projects, as they require but little material. Any kind of good, straight-grained cabinet wood may be used in making them. Walnut has been used very successfully.

Base. The coves that are to be cut into the base can be

Stock. Both ends of the stock are to be carefully squared before any sawing is done on the band saw. If this were not done it would be found very difficult to make perfect surfaces on the four legs of the stock after they had been cut out. After the outline has been sawn from the front it will, of course, be necessary to replace the scraps that have been so removed so as to afford a working surface that will hold the block in a horizontal position for sawing from the other direction. In sawing the block, the cutting should be done



slightly outside the lines. This is especially necessary at the bottom of the stock so that there will be no difficulty in making the coves of the base and the curves of the stock legs run together smoothly. The coves of the base and curves of the stock should both be dressed smooth after the assembly. If this work is carefully done the joints between them will not be distinguishable.

Top. The outline of the top as seen from the front should first be sawed out. Before any more wood is cut from it, the holes should be bored into three bowls. No difficulty will be encountered in boring if it is done before the bowls are tapered and if the pieces are placed very tightly in a vise or clamp so that they cannot split. Most of the surplus remaining on the sides of the arms can be removed by the band saw. The bowls can be tapered and chamfered with a plane. The arms can be chamfered with spokeshave and chisel.

Assembly. The four screws that hold the base to the stock must be put in carefully and must slant inwardly so as to enter and extend into the center of the legs of the stock. It will also be necessary to bore proper size holes into the four legs before driving the screws, or splitting will likely occur. The base and stock can be firmly clamped together while the holes are being made and screws driven. The dowel that holds the top onto the stock can be easily placed by clamping the two pieces together and then boring the hole for the dowel down through the candle hole of the central bowl and into the stock at the same time.

A rubbed varnish finish is very attractive and will not be affected by tallow drippings.

A CO-OPERATIVE VACATION SCHOOL

H. H. Braucher, University of Illinois, Urbana, Illinois

There is much talk about related information, enrichment, trade information, illustrative material, and the like. Industrial-arts teachers are interested, but with increased teaching loads and full schedules, they are not desirous of tackling the gigantic task of preparing this material single handed.

This work, however, could be turned into an interesting and pleasing vacation job if a group or groups of congenial industrial-arts teachers were to organize for the purpose of gathering first-hand information, make shop trips, and the like.

The modern methods of transportation, or the use of private automobiles, permit groups to visit many plants and spots of interest from which inspiration and enthusiasm for more effective teaching could be garnered. These visits, with discussions between places en route, would result in the accumulation of much that could not be obtained from books. Cameras and notebooks should not be forgotten on these outings for professional betterment.

For best results, these trips should be carefully planned. The woodworking teacher's itinerary, for instance, should include trips to the forests, mills, and factories to study wood as it grows, as it is prepared for the market and as it is used. Besides this, the visiting of some schools could be included in the tour.

Those interested, should start planning now. The method is feasible and promises much as a method for spending an enjoyable vacation, and as a means of furthering one's profession and professional standing.

Personal News

APPOINTED PRINCIPAL

Mr. Benjamin W. Johnson, who has been appointed principal of the Frank Wiggins Trade School in Los Angeles, Calif., has been active in trade and vocational education in California and in other states.

Mr. Johnson, a native of California, was educated in the elementary schools of Philadelphia. He was graduated from the St. Louis Manual Training School, St. Louis, in 1889, and received his professional preparation in Oberlin College, Bradley Polytechnic Institute, the University of Washington, and the University of California.

Mr. Johnson organized the first industrial-arts program and began teaching mechanical drawing and shopwork in Seattle, Wash., in 1894. Later, he became head of the department of industrial education for the city and vice-principal of the Broadway High School. In 1917, Mr. Johnson resigned to become the first regional agent for the Federal Board for Vocational Education in the seven Pacific states.

He was state supervisor of industrial education and city director of vocational education in Wilmington, Del., for one year. In 1921 he went to the University of California as supervisor of the department of teacher training. In 1923 he became assistant director of vocational education at the University.

Mr. Johnson has visited practically every state in the Union in connection with his service in the field of industrial education.

(Continued on page 10A)

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5. Two metal lined compartments for rags; each compartment 7 inches wide, 7⅝ inches high, and 10½ inches deep.
6. Height of cabinet from floor to working top 40 inches. Size of top 33¾x50⅝ inches.
7. No. 9095 made of hard wood, flat varnish finish. No. 529 (same design) made of steel, olive green finish.
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(Continued from page 132)

He has been active in the affairs of the National Society for Vocational Education and the American Vocational Association, serving as vice-president of the latter in 1921. He has contributed generously to the periodical literature in the field of vocational education, and is a joint author with Dr. David F. Jackey in

BENJAMIN W. JOHNSON
Principal, Frank Wiggins
Trade School
Los Angeles, California

various trade analyses published in recent years. He has been active in promoting training programs for the fire and police departments of Los Angeles, and has been responsible for the training of teachers who teach classes in connection with the emergency education program. Practically every teacher on the present school staff received part of his training in classes taught by Mr. Johnson.

MR. JACKEY AT CALIFORNIA UNIVERSITY

David F. Jackey, who has been appointed Supervisor of Trade and Industrial Teacher Training in the University of California at Los Angeles, was formerly supervisor of classes in trade and industrial subjects in the University of California at Berkeley.

Mr. Jackey was born in Wheeling, W. Va., and received his

DAVID F. JACKEY
Supervisor of Trade and Industrial
Teacher Training
University of California
Los Angeles, California

education in the Powhatan Point (Ohio) High School and in Carnegie Institute of Technology, Pittsburgh, Pa. He holds an M.A. degree, given by the University of California in 1925, and a Ph.D. degree, given by the University of Pittsburgh in 1933.

He has wide experience in the trade and industrial field and has held numerous positions in the public schools, in teachers' colleges, and in universities. In 1919–20, he was co-ordinator of trade and industrial education in the schools of Martins Ferry,

(Continued on page 12A)

NEW COLORS

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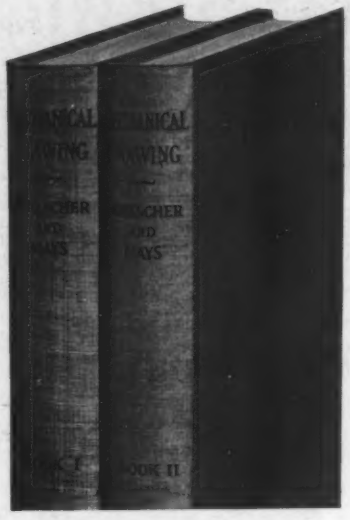

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Write for the Summer Session Bulletin

Director of Summer Session

The Stout Institute **Menomonie, Wisconsin**

(Continued from page 10A)

Ohio, and from 1920 to 1922 was supervisor of trade and industrial education at Sidney, Ohio; he was head of the industrial-arts department of the Chico (Calif.) Teachers' College from 1922 to 1931; assistant supervisor of teacher-training classes in trade and industrial subjects for the University of California, Los Angeles, from 1931 to 1933; and supervisor of teacher-training classes in the University of California, Berkeley, from 1933 to 1934.

Mr. Jackey has been active in the affairs of the California Vocational Association and the American Vocational Association and has contributed generously to the literature on trade and industrial subjects.

¶ Mr. Walter W. Stewart, 53, instructor of mathematics in the Boys' Technical High School, Milwaukee, Wis., died suddenly at his home, following a heart attack. Mr. Stewart, who was born in Seymour, Wis., was graduated from the University of Wisconsin and taught in the Kiel High School before going to Milwaukee. He was for three years head of the mathematics department in the Milwaukee School of Engineering. He is survived by his widow, a daughter, and two sons.

¶ Fred Milgate, assistant director of manual training and instructor in mechanical drawing in the east-side school of Aurora, Ill., died in St. Joseph's Mercy Hospital on February 24, after a month's illness.

Mr. Milgate was a graduate of the East High School of Aurora and later attended the Northern Illinois Teachers' College at DeKalb. He began his teaching career as an instructor in mechanical drawing and manual training in 1918, and three years ago was made assistant to the head of the manual-training department in the east-side school.

Mr. Milgate is survived by his widow, a daughter, and a son.

¶ O. H. Day, director of vocational education at Kansas City, Mo., has concluded the first of a series of conferences for supervisors in the Kansas City area.

¶ Mr. Alfred G. Pelikan, director of art in the public schools of Milwaukee, Wis., is the author of a course in freehand and figure drawing, prepared for the study courses of the National Art Hobby Guild, New York City.

Associations, Conventions

MEETING OF THE SCHOOL CRAFTS CLUB OF NEW YORK CITY

The regular monthly meeting of the School Crafts Club of New York City was held on Saturday evening, January 26, in the New York Y.M.C.A. Building.

Dr. Julius Yourman, of the New York University School of Education, spoke on the topic, "A Fallacy Fundamental in Industrial Arts," in which he said that "Industrial arts does not need any justification as to why it exists." He pointed out that it is necessary to "live down" an inherited stigma of inferiority unjustly fostered by parents themselves laboring under a false impression. Industrial arts is, and should be, justified because it is the core of all educational subjects, not only for those intending to enter industry or engineering, but also for the feeble-minded, students of low I.Q., and others. All children should be given opportunity to test their ability in academic and general education and in the appreciative subjects. Other speakers on the program were Mr. Fred Umph, of New York City, who talked on "Molding Lead in Sand Molds," and Mr. Howard Barrett, of New Milford, N. J., who discussed "The Electron Theory for Eighth-Grade Students."

The next meeting will be held at the Y.M.C.A., in New York City.—*F. A. Russen.*

SOUTH DAKOTA ASSOCIATION MEETS

The South Dakota Vocational Association has been gaining in importance and interest during the past two years. Previous to

(Continued on page 14A)

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(Continued from page 12A)

that time the various groups had struggled along independently without any co-operation. At the fall meeting two years ago, an association was formed of five groups, comprising industrial arts, agriculture, home economics, trades and industries, and commercial teachers and supervisors. The purpose to be achieved was a closer co-operation toward common interests and representation on the general program of the annual convention. As a result, both vocational and allied work in the schools has come into prominence in the state.

At the regular annual meeting, officers for the next year were elected as follows: President, O. P. Cook, Lead; vice-president, Miss Nellie McLaughlin, Beresford; secretary-treasurer, E. J. Daniels, Brookings.—*O. P. Cook.*

GENERAL CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION MEETS IN HARTFORD

The Central Connecticut Industrial-Arts Association held its second annual meeting on January 25, in Hartford. Approximately 60 members were present.

Mr. Eugene Giammatteo, chairman of the program committee, introduced Supt. Fred D. Wish, Jr., who welcomed the visitors to the city. The principal speaker was Dr. Garton K. Wager, Director of Industrial Arts, New Rochelle, N. Y., who talked on the topic, "How Industrial Arts Becomes Real Education." He pointed out that industrial arts gives first-hand information which is the basis on which other education can be better understood. There must be closer relationships between industrial arts and other subjects in the school curriculum if the schools are to realize the full possibilities of real education. Knowledge, he said, means more than the mastery of symbolic subject matter; it must concern itself with the real conditions of life.

Mr. John C. Houdlette, president of the association, presided at the business meeting. Meriden was selected as the place for the next meeting.

The following officers were elected for the ensuing year:

President, William Moran, Waterbury; first vice-president, Hoemer Jones, West Hartford; second vice-president, Alfred Anderson, Wethersfield; treasurer, Sheldon Barker, Hartford; secretary, Harry Barnicle, Hartford.—*Harry A. Barnicle.*

SOUTH DAKOTA ROUND TABLE MEETS

The industrial-arts round table of the South Dakota Education Association held its annual meeting November 24 to 26, at Huron. An inspiring program was carried out, which indicated that the industrial-arts work in the state is on the upward trend.

At the business session, the following officers for the year were elected: President, Mr. W. W. Wills, Rapid City; secretary-treasurer, Mr. H. P. Gerber, Aberdeen.—*O. P. Cook.*

INDIANA TEACHERS' ASSOCIATION CONVENTION

The Indiana Industrial-Education Association will hold its annual meeting on March 29 and 30, in Terre Haute.

New Publications

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(Continued on page 17A)

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(Continued from page 14A)

Bookbinding Made Easy

By Lee M. Klinefelter. Cloth, 84 pages, 6 by 8⅞, illustrated. Price, $1. Published by the Bruce Publishing Company, Milwaukee, Wis.

This book contains simple and clear directions for bookbinding. The illustrations show the processes step by step, so that the book lover, the junior-high-school student, and the home craftsman will have no trouble in following the author's plain explanations in actually doing what the modern bookbinder does, and what the bookbinder of old did in placing between covers the books that link the present with the past.

Beginning Woodwork Units

By William E. Roberts. Cloth, 96 pages, 5¾ by 8¾ illustrated. Price, 48 cents. Published by The Manual Arts Press, Peoria, Ill.

A book for the junior-high-school pupil on the simple principles of construction and woodwork and of how to use woodworking tools. There are 38 operation units with concise explanations showing the student how to proceed. The booklet is freely illustrated with sketches made by the author.

Automotive Essentials

By Ray F. Kuns. Cloth 433 pages, 6¼ by 9¼, illustrated. Price, $1.92. Published by The Bruce Publishing Company, Milwaukee, Wis.

This revised edition of this well-known text has been completely rewritten. Like its predecessor, it is a clear, nontechnical exposition of the fundamental facts about the automobile.

The book has been brought right up to date, and is profusely illustrated. It presents a definite plan of instruction.

A generous number of oral review questions are part of each chapter, as is also a list of research questions and problems.

Problems for School and Home Workshop

By Louis M. Roehl. Paper 88 pages, 6 by 9, illustrated. Price 50 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

An exceedingly helpful book for the boy and the teacher in the rural school. The author, knowing conditions on the average farm, directs his book at the farm boy whose shop contains no power machinery and comparatively few hand tools. The projects described can be made by the average junior-high-school boy, and all of them will be welcomed in the home because of their usefulness.

Introductory Metalworking Problems

By Lewis C. Bell, and Glenn N. Shaeffer. Cloth, 24 pages, 6 by 9, illustrated. Price, 24 cents. Published by The Manual Arts Press, Peoria, Ill.

The book is divided into a unit of sheet-metal work and one of bench metal work. The portion on sheet-metal work contains seven simple projects, while the bench metal work is represented by eleven projects.

Engineering Drawing and Science

By Harry A. Jones and T. J. Longhurst. Cloth, 197 pages, 6¼ by 9¼, illustrated. Published by The Clark and Stuart Company, Ltd., Vancouver, B. C.

This book contains a series of lessons in drawing, designed to impress the fundamentals of the different types of drawing required in the various engineering branches. The work can, therefore, be used as a prerequisite to the special study requirements of the particular branches of engineering.

News Notes

CONTRACTORS AND HELPERS UNION MEET

A joint meeting of the Heating, Piping, and Air Conditioning Contractors, and the Steamfitters and Helpers' Union of Milwaukee was held on February 26, in the auditorium of the Boys' Technical High School, Milwaukee, Wis.

(Continued on page 19A)

Teach both Skills, Mental and Manual

That intangible something called "skill" is a by-product of repetition. Manual shop skills are the by-product of repetitive shop processes with hand and power-operated tools and equipment. Mental shop skills are a by-product of the repeated use of the related information contained in shop books.

A student cannot repeat his instructor's shop demonstration or his shop lecture but he can read the material contained in a book as frequently as necessary. Skill in the use of manual and mental tools comes with their repeated use.

MENTAL SHOP-TOOLS

Even though the mental shop-tools are not expensive it is important that they be selected carefully. International Texts are ideal for pupils to read and study individually in order to develop their mental skills. The following groups of titles are now giving satisfaction in hundreds of schools:

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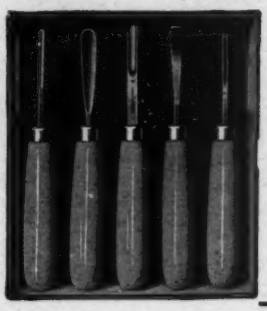

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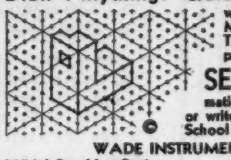

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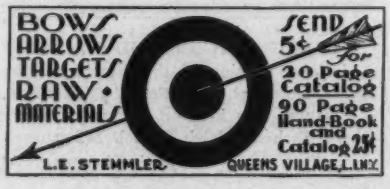

(Continued from page 17A)

The group viewed slides and films on pipe welding, and then accompanied Mr. Emil Soike, the welding instructor, on a visit to the night class in pipe welding. Mr. John S. Jung, the speaker of the evening, complimented the Boys' Technical High School on its welding setup, and on the fact that the school offers special classes to those trades in which the welding process is used.

Mr. F. W. Ziegenhagen, vice-principal of the Mechanic Institute, offered the facilities of the school to the two organizations, and between films provided organ selections by the school organist.

National Art Hobby Guild

The National Art Hobby Guild, 52 Vanderbilt Ave., New York City, has announced its nation-wide program, which is characterized as new, youthful in spirit, refreshing, creative, and capable of being carried out with friendliness and informality.

The Guild has adopted the slogan, "art for fun, and art for use," and seeks to make its contact with art teachers throughout the country, to build up valuable support for art teaching in the schools, and to create interest in art expression.

The program has been arranged primarily for adults and seeks to promote home study courses in the arts and crafts.

The National Art Hobby Guild is not organized for profit but is intended to be self-supporting through annual membership fees of $3. It offers both membership in the national organization and art participation in local units of the guild throughout the country.

Trouble-Shooting Contest for Auto Mechanics at Urbana, Ill.

A trouble-shooting contest for auto mechanics will be held April 19 to 20, in Urbana, Ill. The contest is limited to students not over 20 years of age. Not more than one team may be entered from any one school and those who participate in the contest must be regularly enrolled in an auto-mechanics class. The arrangements for the contest are in charge of a special committee which is delegated to select the six judges whose duty it will be to (1) set up points of trouble, (2) disqualify a team for violation of rules, (3) determine the winners of the contest, and (4) arrange and present appropriate awards to the winners of the contest.

SchoolShopEquipmentNews

NEW WALLACE WOODWORKING MACHINES

J. D. Wallace & Company, Chicago, Ill., has issued its new supplement to Catalog No. 407, containing illustrations of its woodworking machines, for use in small and large school shops.

The catalog lists jointers, lathe tools, shapers, universal saws, radial saws, and band saws. The machines are well designed, durable in construction, portable, and capable of new high speeds for improved work and reduced shop costs.

These supplemental catalogs are available upon request.

NEW DUDLEY PICKPROOF LOCK

A new door lock which is drillproof, gripproof, jimmyproof, and forceproof has just been placed on the market by Mr. George Dudley Full, of the Dudley Lock Company, 235 West Randolph St., Chicago, Ill.

The new pickproof lock is the latest word in door locks of this kind and represents three years of work and the expenditure of several thousand dollars. It is designed to give positive burglary protection and can be opened only with a four-edge key. Keys to the lock are copyproof.

Complete information is available upon request.

ANNOUNCE NEW DRAWING INKS

The Charles M. Higgins Company, Inc., has announced additions to its line of drawing inks, with additional new colors in blue, green, light brown, and lemon yellow. They have also renamed some of the old colors. Green has been changed to emerald green, brown to dark brown, yellow to chrome yellow.

Complete information is available by writing to the Charles M. Higgins Company at 271 Ninth St., Brooklyn, New York.

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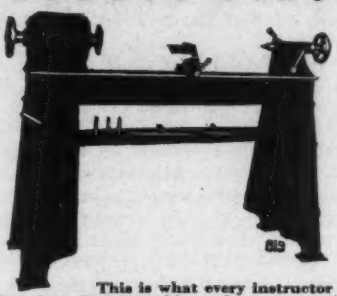

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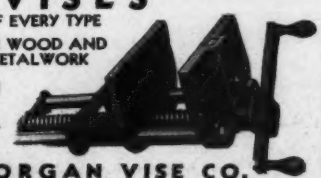

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